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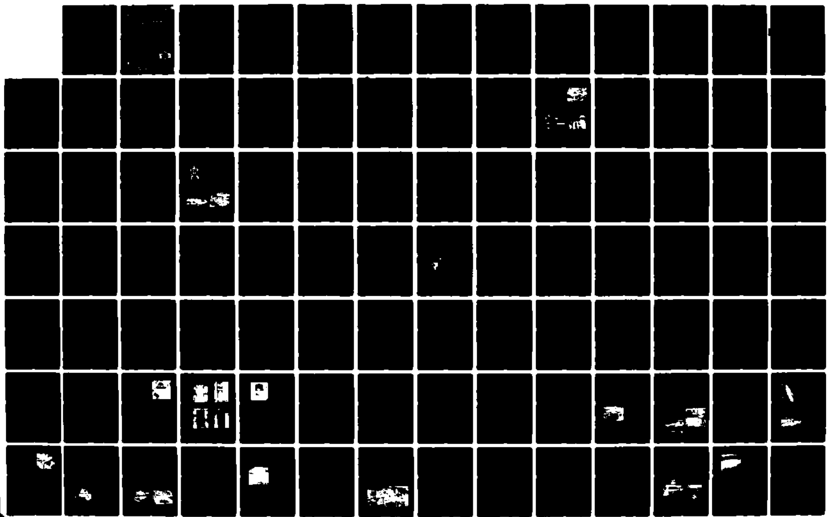

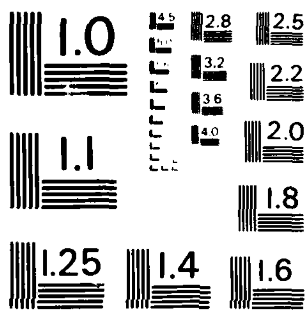

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CEDAR GROVE: AN INTERDISCIPLINARY INVESTIGATION OF A LATE CADDO FARMSTEAD IN THE RED RIVER VALLEY

Arkansas Archeological Survey
Fayetteville, AR 72701

31 October 1983

Final Report

Prepared for
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Excavations by the Arkansas Archeological Survey under contract with the New Orleans District of the U.S. Army Corps of Engineers at the Cedar Grove site (3LA97) in Lafayette County, Arkansas, recovered the remains of a late Caddo (Belcher/Chakanina phase) farmstead at a location that had been later used for a historic levee, cemetery, roadbed, and fields. A comprehensive interdisciplinary team studied the recovered data on historic remains, settlement systems, lithics, ceramics, geomorphology, chronology, floral and

7. James R. Purdue, Daniel Wolfman, John Miller, Michael J. Kaczor, Johnathon E. Ericson, and Elizabeth A. Coughlin

20. faunal remains, pigments, and bioarcheology. The results of these studies indicate that the farmstead was located on a point bar ridge within the axis of a Red River meander. Settlement pattern on the site showed the presence of at least one circular house, plus the possible presence of two additional houses and two ramada work structures. A skeletal population of 14 individuals represented a patrilocal family cemetery of people consuming a moderate proportion of maize in their diet. Although no signs of European diseases were found in the bioarcheological studies, evidence of possible European contact was found in the form of two bone buttons from an aboriginal grave. The aboriginal graves showed evidence of a ranked society, although the farmers represented were probably not at the highest end of the Caddoan social scale.

Historical documentary and archeological research have also traced local land history after American settlement began, yielding a perspective on historic land use contrasting to that of the Caddo.

The study confirmed portions of the Teran Soule ethnographic model of Caddoan settlement systems and site settlement pattern, and placed the site within the contextual framework of the Caddoan interaction with their natural environment, as well as assessing the impact of European contact.

CEDAR GROVE: AN INTERDISCIPLINARY INVESTIGATION OF A LATE CADDO FARMSTEAD IN THE RED RIVER VALLEY

ABSTRACT

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Field Crew: Assistant Archeologist: John Miller; *Crew Chiefs:* Randall Guendling, Michael Swanda, Jeffrey Otinger, and Ross Dinwiddie; Field Assistants: Don Manchester, Patti Thomsen, Andy Cloud, David Cushman, Monica Lowder, Rick Vanden Heuvel, Nancy Shaw, David Shaw, Peter Mires, Dot Kitchens, Marge Jernigan, Rose Lockwood, Mike Chapman, John Lewis, and Marcia Northcutt.

Laboratory Crew: Supervisor: Teresa Hoffman; Assistants: Bill Shumaker, Jacquetta Ellis, Dorothy Russel, Phyllis Clancy, Nancy Shaw, Cathy Hess, and Marc Collier.

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A number of other Survey personnel are specialist contributors to the research: Beverly Watkins as historian, Sandra Parker and her assistants Susan Houston and Carol Andrews performed the project's computer applications and served as statistical consultants; E. Thomas Hemmings conducted geomorphology and soils studies; Daniel Wolfman gave his valuable chronometric expertise, John Miller assisted Schambach with the ceramics, Skip Stewart-Abernathy provided assistance on historical archeology, and Michael Kaczor *did soils analysis.*

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My apologies are offered to anyone whose name I have omitted by oversight.

Neal Trubowitz
Cedar Grove
Project Archeologist

CHAPTER 1

INTRODUCTION TO THE CEDAR GROVE PROJECT

by Neal L. Trubowitz

The Cedar Grove site was discovered during construction of the Field Revetment by the New Orleans Distict of the Corps of Engineers along the Red River in Lafayette County, Arkansas. Pedestrian survey and a boat reconnaissance of the bankline prior to construction in April 1978 by Coastal Environments, Inc. had encountered no evidence of archeological remains (Pearson and DuCote 1979:4-37). However, a year later, bulldozing of the south bank of the Red River for the revetment slope exposed a skeleton of recent origin and a washed-out tombstone was recovered some distance downstream from the human remains. As construction excavations continued, additional tombstones dating to the early 1900s were discovered. They were buried approximately a meter below the ground surface under crevasse splay deposits laid down by the Red River floods of 1927-1930 (Figures 1-1 and 1-2).

Hearing of the cemetery discovery through newspaper accounts, Arkansas Archeological Survey archeologists visited the cemetery with the U.S. Army Corps of Engineers' project engineer and found that it surmounted a prehistoric aboriginal site. This is often the case for historic occupations on the Red River floodplain (Figure 1-3). Construction at the site area was suspended by the Corps, leaving the site isolated in the midst of the finished revetment (Figure 1-4).

After additional visits by both Arkansas Archeological Survey and Corps archeologists, a purchase order (No. DACW29-80-M-1870) was issued by the Corps to the Survey for testing of the site to acquire the information needed for a determination of the site's eligibility for the National Register of Historic Places. These tests were carried out under the direction of Neal Trubowitz, in consultation with Frank Schambach, between June 18 and 25, 1980.

RESULTS OF TESTING

A detailed discussion of the testing project and its results are reported in Schambach et al. (1982). This section briefly summarizes these results.

Aboriginal Components

Two aboriginal components and a historic component were found on the Cedar Grove site (Figure 1-5). Based on ceramic associations, the primary occupation was identified as a Caddo IV/V hamlet probably dating between A.D. 1650 and 1750. An earlier Caddo III occupation with ceramics dating between A.D. 1400 and 1500 was found isolated in the east side of the project area. Based on preliminary assessment of the testing data, Hemmings (1982) determined that the main Caddo IV/V component had probably been established on a point bar ridge near the downstream arm of Lester Bend, a fairly stable meander curve of the Red River. During the aboriginal period, this locus was safe from any imminent erosion within the active meander belt. It was surrounded by a variety of floral resources in bottomland forests, canebrakes, and swamps, which supported a diversity of Austroriparian fauna. Local soils were fertile and tillable through aboriginal agricultural methods.

The only evidence found of the Caddo III component was in a midden level 2.8 m below the surface on the far east side of the site in the indirect impact zone. The Caddo IV/V component did not directly overlie the Caddo III component there, and elsewhere on the site the tests were not deep enough to conclude whether Caddo III material extended below Caddo IV/V occupations or if they were horizontally distinct.

Below the levee and extending beyond it on either side was the aboriginal occupation or midden from the Caddo IV/V component. This occupation is interpreted as a single continuously inhabited farmstead. However, for purposes of ceramic analysis, the occupation is divided into Cedar Grove II, the Caddo IV Belcher phase from A.D. 1670-1700, and Cedar Grove III, the Caddo V Chakanina phase from A.D. 1700-1730. In the indirect impact zone, evidence of an aboriginal structure of some kind (Feature 3) was found. Large chunks of daub, a postmold, and Caddo IV ceramics were found associated with this feature.

Historic Components

The historic occupation included a presumed Civil War era levee and a historic black cemetery (ca 1834-1927). Construction techniques that were revealed in excavation profiles indicate that the levee was built by hand, probably sometime between 1834 and 1887. The levee followed the line of a natural rise and some of the midden soil from the aboriginal occupation had been used for construction; the levee fill was rich with late Caddo ceramics, lithics, and other remains.

The testing uncovered evidence of at least three unmarked historic burials. These were in the vicinity of the four graves with tombstones that had been uncovered during the construction work. Some of these stones were marked with the insignia of the Cedar Grove Chapter of the Supreme Royal Circle of Friends, a turn-of-the-century black fraternal organization. Although it is no longer in operation, the local Cedar Grove Church and community still is in existence; some of the elder members could recall the cemetery at Cedar Grove before it had been buried by the floods.

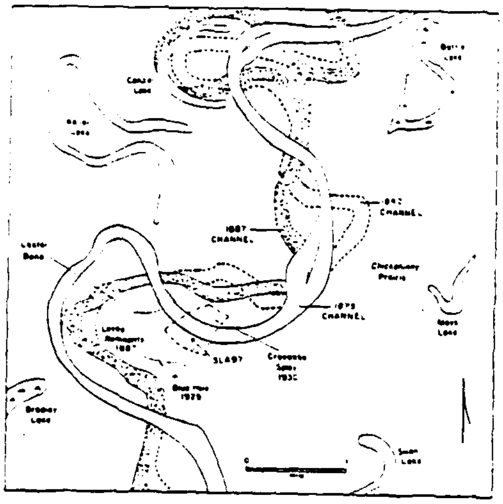

Figure 1-1. Red River channel changes and floodplain features in the vicinity of the Cedar Grove site

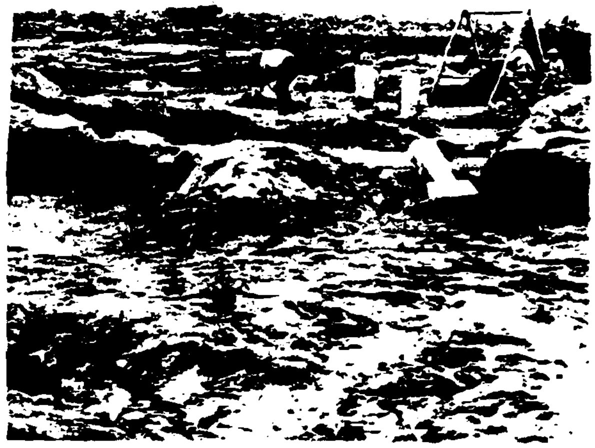

Figure 1-2. Tombstones revealed by construction at Cedar Grove, looking southeast (AAS negative number 804670)

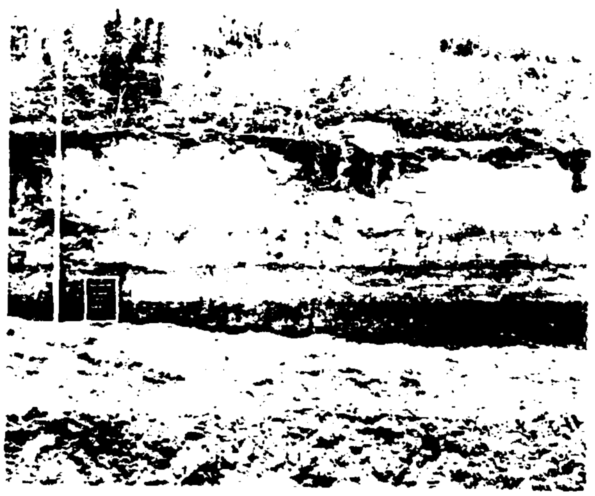

Figure 1-3. N-S Trench 2 west profile showing thick dark band of aboriginal midden buried nearly a meter below the surface (AAS negative number 804656)

Figure 1-4. 3LA97 left isolated as an unexcavated block within the finished revetment, looking west (AAS negative number 807558)

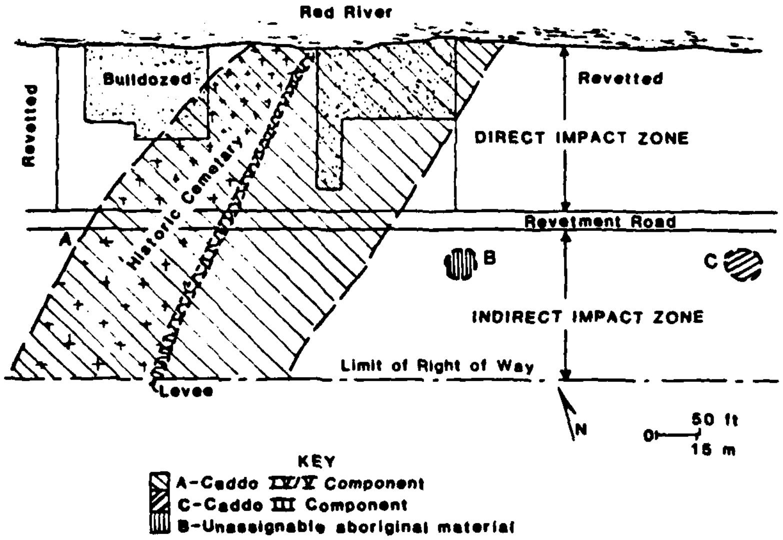

Figure 1-5. Projected component locations. A. Caddo IV/V component; B. unassignable aboriginal material; C. Caddo III component.

RECOMMENDATIONS FOR DATA RECOVERY

The report on the testing (Schambach et al. 1982) concluded that 3LA97 had the potential to provide a wide range of data on Caddoan settlement patterns, social structure, technology, subsistence, dating, and possible early European contacts. Examination of the buried historic levee was expected to provide more data on Euramerican land use in the Red River. Despite historic disturbance, the Caddo IV/V occupation could be studied as a unified aboriginal component uncomplicated by earlier components. Study of the geomorphology of the site would also provide information on the processes of river deposition and meandering that had preserved the site, which could then be applied to site location elsewhere in the river basin. This range of data and its excellent preservation, along with the uniqueness of the site in the archeological record of the area, led to the conclusion that the site was a highly significant cultural resource which in the opinion of the Contract Program of the Arkansas Archeological Survey was eligible for inclusion in the National Register of Historic Places. As construction was already in progress on either side of the site, avoidance and in situ preservation of the site area in the direct impact zone was not an alternative for impact mitigation. Full scale problem-oriented excavations were recommended to recover as much of the data present in the affected area as was possible with existing archeological technology.

State Archeologist Hester Davis and the Keeper of the National Register concurred that 3LA97 was eligible for inclusion on the National Register and that data recovery was the appropriate means of mitigation of the construction impact. The Corps prepared a scope of services for this work while the Survey developed a research proposal. This work was to also include the testing of the Sentell site (3LA128), which was discovered during the testing of 3LA97. This earlier Caddo site was approximately 1 km east within the completed revetment. The scope of services called for testing at 3LA128, data recovery within the direct impact zone at 3LA97, and some additional excavations in the indirect impact zone at 3LA97 to further investigate the late Caddo IV structure and the isolated Caddo III midden found there during the testing. Documentary research was specified for the history of the cemetery and church and the levee within the surrounding area. The historic cemetery was presumed to be a small plot at the north end of the direct impact zone from which few additional graves were expected to be found. Therefore, the scope of services called for the archeologists to map and record any additional graves found.

The removal of the identified historic graves was to be left to the Red River Levee District No. 1 and the Cedar Grove Church. In the interval between the site testing and data recovery the graves already identified were disinterred and the remains were reburied at other local cemeteries used by the Cedar Grove Church.

DATA RECOVERY AND ANALYSIS

Field operations for the data recovery at 3LA97 began October 25, 1980, under the direction of Neal Trubowitz. Excavations continued every day that weather permitted through December 21, 1980. The testing at 3LA128 was completed by a smaller crew between January 12 and 19, 1981.

From the beginning the approach to the research design, implementation, and analysis for the Cedar Grove project was interdisciplinary, with specialists advising on data recovery needs for the various data that were expected to be found on the basis of the test excavation results.

In the past many archeological studies have utilized specialists for background research, taking "a static, classificatory approach to environmental variables, regarding the biophysical landscape as a spatial and temporal backdrop" (Butzer 1980:417); commonly the contributions of these specialists have not been adequately integrated into the basic research goals of archeology. Butzer underscores the need for a "contextual approach" in archeology.

> The goal of contextual archeology should be the study of archeological sites as part of a human ecosystem, within which past communities interacted spatially, economically, and socially with the environmental subsystem into which they were adaptively networked (Butzer 1980:417).

The natural environment is regarded as a dynamic component of the human ecosystem whose study must be integrated with investigations of artifacts and their archeological context if we are ever to come to a realistic understanding of the interrelationship between culture and environment. It was our intent to make the final Cedar Grove report such an integrated report.

Funding for the various specialist analyses was contingent on assessment of each class of data returned to the laboratory. Proposals for chronometric studies and bioarcheology were submitted to the Corps in March 1981; a second package containing geomorphology, subtractive technology, floral and faunal remains was submitted in June 1981, augmented by a pigment proposal in January 1982. Corps approval for the first package came in May 1981 and the rest of the studies were approved in April 1982. In accordance with contract stipulations, a draft report was submitted to the Corps in March 1982. This report had all the basic background data, but only the bioarcheological specialized study had been completed. Copies of this report were also distributed to all the specialists. The rest of the analyses were completed to meet the contract deadline for a second draft volume at the end of February, 1983. Condensation to a single volume for the final version of the report was submitted to the Corps in October 1983, following receipt of the peer and Corps reviews in May. Some desirable aspects of the research (such as a detailed assessment of soils analysis results and distribution of various artifact classes across the site) could not be completed, but all raw data for these areas have been presented for reference by other researchers.

The field research at Sentell (3LA128) brought in a smaller amount of ceramics, lithics, soils, and floral and faunal material, and these were included with the Cedar Grove proposal package. These analyses had not been approved at the time the Sentell test report was due early in 1981 (Trubowitz and Schambach 1982). These are therefore included in this report and provide some comparative data on nearby Caddo occupations.

The project focused major research attention on the Caddo IV/V component in the direct impact zone at Cedar Grove. The Caddo III component remnants were found to be both horizontally and vertically isolated in the indirect impact zone. Since there was no further danger of disturbance from construction, only a single excavation unit, 3 m square, was dug. This unit was designed to collect a sample of diagnostic material to confirm the assessment of the few artifacts recovered from that component in the test phase of the research. Few conclusions as to the nature of that component are therefore possible, but it is probably related to an earlier Caddo farmstead, which was also located on a point bar as were the later Caddo IV/V component (Figure 1-5).

All Cedar Grove historic data were recorded during the course of the excavations, but it was not a primary research focus. When the mitigation excavations revealed the large size of the historic cemetery, separate negotiations were entered into for the purpose of recovering biophysical and archeological data for that component. The field recovery of these data under a change order to the existing contract was authorized in the summer of 1982. The results of the investigation of the historic cemtery were presented in a separate research report (Rose 1983).

CADDO BACKGROUND

Before going into the details of the Cedar Grove investigations, it will be useful to briefly discuss the implications of the research at 3LA97, which focused on the Caddo IV/V component. Caddo V is the least known period in Caddo archeology, and at present is represented by only two known sites or site clusters in southwest Arkansas (Schambach et al. 1982). The Cedar Grove site investigations were the first opportunity to recover and study a wide variety of data on the Caddo, who may be linked with the historically identified Kadohadacho, one of the two largest Caddo Indian tribes.

The terms "Caddo" or "Caddoan" come from a French abbreviation of "Kadohadacho," a word meaning real chief. Today these terms designate seven different things depending on the context. Following Story (1978:46) they can refer to (1) a Native American linguistic family, (2) a subdivision of related dialects within that family, (3) a collective term for up to 25 tribes or bands, (4) three possible confederacies, (5) a tribe or band within one of those confederacies, (6) particular prehistoric and historic archeological assemblages, and (7) the geographic region containing these archeological remains (Figure 1-6). The region stretches between the Mississippi Valley on the east and the Great Plains on the west, and between the southern Ozark Mountains and the Gulf Coastal Plain from north to south. This area falls within portions of six states, mostly in Arkansas, Louisiana, Texas, and Oklahoma. It incorporates as a natural area the oak-hickory Southeastern Woodland environment.

In this study the primary usage of the terms Caddo and Caddoan are the archeological manifestations. The area is delimited by the extent of certain archeological remains, mostly ceramics, which are distinctive in specific temporal, spatial, and functional contexts at the type and attribute level. Other traits including house types, burials, and other material culture are included in various Caddoan complexes. While there is variation within the Caddoan area, the archeological record in the Arkansas Great Bend region is currently interpreted as showing continuity over time and in situ development from the Archaic period to A.D. 1600 when European contact induced cultural changes and later population displacements.

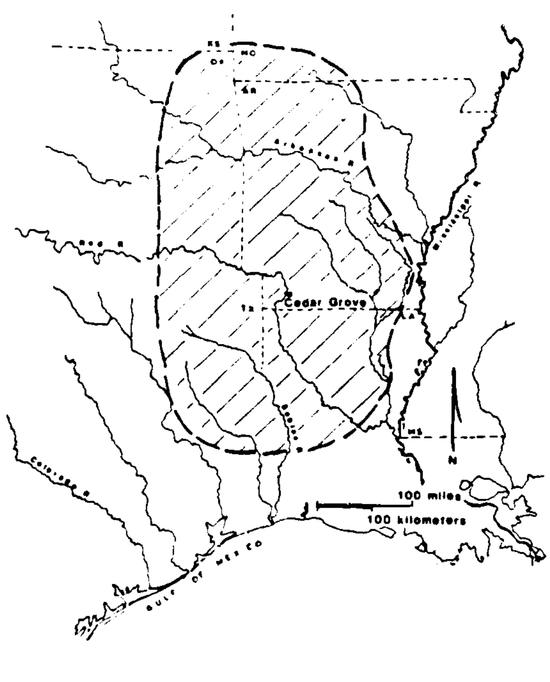

Figure 1-6. The Caddoan archeological region

In many ways Caddoan archeological research has mirrored that of the changing research interests of American archeologists in general (Story 1978:57). Initially research was specimen oriented, focusing on the cemeteries of major sites. The context of artifacts was often poorly recorded if at all, and general refuse was only incidentally collected, if not ignored. For professional archeoloigsts, this period came to a close at the outbreak of World War II, but pothunters continue in this vein today. In the 1940s and 1950s systematic description and synthesis, a taxonomic approach, was applied in the Caddoan area, leading to the time-space framework that is still used today (Wyckoff 1974). Since the 1960s the effects of processual thinking has been felt, and there has been increased interest in subsistence-settlement systems, intrasite variability, sociopolitical delimitation, and interpretations of Caddoan culture in behavioral terms (Story 1978:61).

In terms of its place in archeological schema, Schambach (1982) has located the Cedar Grove site within the portion of the Trans-Mississippi South which he has designated the Great Bend region. He termed the immediate area surrounding 3LA97 as the Spirit Lake locality (Figure 1-7). Schambach (1982) summarized the general regional prehistoric sequence as well as discussed the Caddo IV (A.D. 1500-1700) and Caddo V (A.D. 1700-1800) periods in greater detail. His major points are briefly outlined here.

During the Caddo IV period, the lower portion of the Great Bend from Fulton, Arkansas to Shreveport, Louisiana was host to Caddoan people who left archeological sites grouped under the Belcher phase, based on a series of distinctive pottery types (Webb 1959). Belcher phase sites near Cedar Grove include some farmsteads like Gum Point (3LA87) and Spirit Lake (3LA83), which are about 8 km to the north, and the major mound construction at Battle (3LA1). Battle is the largest known Caddoan mound, and is within easy walking distance to Cedar Grove (Figure 1-7). Upstream from Fulton in Bowie County, Texas, Caddo IV sites are grouped in the Texarkana phase.

Bowie County also contains a series of Caddo V sites. Rosebrough Lake site (41BW5; Miroir et al. 1973) has been concluded to be the location of a French trading post established by Benard de la Harpe in 1719. Rosebrough Lake and the nearby array of sites termed the Hatchel-Mitchell-Moores complex have produced a combination of limited European trade goods in association with the primary ceramic marker type for Caddo V, Natchitoches Engraved. Mildred Wedel has argued (1978) that these sites are the remains of parts of the Upper Nasoni Caddoan village that was visited at the end of 1691 by the Teran expedition, which was sent from Mexico to establish missions among the Caddo. Williams (1964) assigned Caddo V sites such as these to the Little River phase.

However, until the discovery of the Cedar Grove site, no Caddo V sites had ever been investigated professionally in the Great Bend region in Arkansas. Based on the tests at 3LA97 and recorded pottery collections from the surrounding area, Schambach (1982) defined a new Caddo V "Chakanina" phase ceramic assemblage, which he distinguished from the Little River phase assemblages in Texas.

Cedar Grove's significance is inversely related to the status of knowledge regarding the late Caddoan occupation of the Red River Valley in Arkansas. Little is definitely known archeologically about the lifeways of the Native Americans who lived along the broad Red River floodplain. What we do know was revealed in the small windows dug into the Caddoan mortuary and ceremonial mounds. Many of those sites have since been lost to the meandering curves of the Red River. Others have just as irreparably been destroyed by the depredations of persons who (either unknowingly or uncaringly) have torn apart sites either for landfill, to level their fields, or to possess and/or profit from sale of mortuary offerings that the Caddoans left for the honor and comfort of their deceased relatives and friends. Thus, the information that has been retrieved in controlled excavations is limited.

Yet, through records left by early Spanish and French visitors we have some descriptions of the general lifestyles of Caddoan Indians to the south, who must have lived in the same way as their more northern counterparts who inhabited the Red River between modern Fulton, Arkansas and Shreveport, Louisiana.

While English colonization was taking place on the Atlantic coast of North America, France and Spain vied for control of the Gulf Coast and the Lower Mississippi Valley. Between 1685 and 1762 several Spanish and French outposts for commercial, military, and/or missionary endeavors were established in this area.

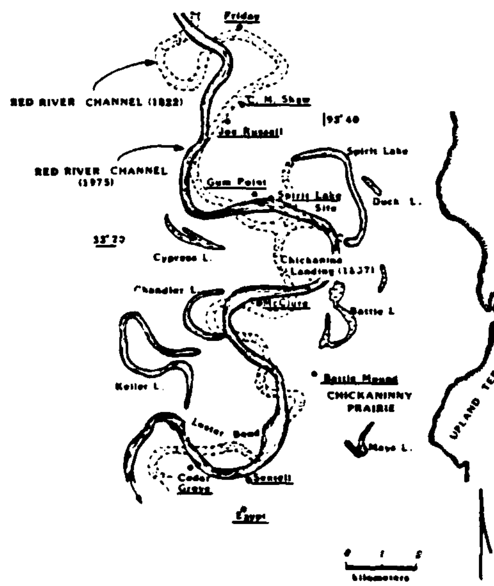

Figure 1-7. **Archeological sites in the Spirit Lake locality**

The Indians we know as Caddo were not visited by trained anthropologists until the early 1890s, after 200 years of sustained contact with Europeans had substantially altered their culture and removed them from their original homeland. Although no well balanced ethnology derived from intensive firsthand observation by an anthropologist has ever been done, the extensive documentary research on the colonial records of Spain, France, and the early United States (i.e., Swanton 1942; Griffith 1954) has provided us with an outline of Caddoan culture, admittedly screened through the eyes of the missionaries, soldiers, explorers, government officials, and traders who observed the Caddo between 1542 and 1820.

The Caddoan tribes in the Red River Valley lived in dispersed settlements along the river margin, adjacent to fertile soil and permanent water sources. Homesteads of one or two families consisted of a house, an arbor or covered work platform, and a storage structure, with surrounding fields of the staple crops of corn, beans and squash. Men helped in the construction of the wattle and daub houses and initial groundbreaking for the fields (both community activities), but their primary concern was hunting wild game, particularly deer, bear, and later buffalo, which provided the Caddo with raw materials for many of their tools, clothing, and ornaments. Women maintained the household, cared for the crops, and collected wild plant foods, presumably also raising the children.

Religious life was centered around a community temple mound where the tribal civil and religious leader, the Caddi,

resided. The society was hierarchically structured with lesser functionaries and a council of elders under the Caddi, who in turn was subject to the leader of the confederacy, the Xinesi. Deference and respect attended each level of personage in relation to their position within the hierarchy, along with rights to various services and goods. These political and religious posts appeared to be inherited by male descendents, although there are other statements on matrilocal residence and matrilineal descent, and females holding political influence. Shamans were frequently mentioned by the missionaries as interfering with their proselytism of the Caddo, but the shaman's position in the hierarchy is unclear.

While the efforts of missionaries usually failed, traders had an immense impact. Spanish and French goods were easily incorporated into earlier Indian trade networks (Gregory 1973) in which salt manufactured at local salines, pottery, and the wood of the Osage orange (valued for bows) were exchanged for hides and Gulf Coast shells. Horses, cattle, ornaments, firearms, liquor, metal goods, and cloth became the stock of mixed-blood traders, as Caddoan groups shifted closer to the trading markets.

Contact with Europeans also exposed the Caddo to the ravages of diseases they had no immunity against, and epidemics, notably in 1691 and 1777, carried off large portions of the population, while the encroachment of enemy Indian groups such as the Osage shrank the territorial range of the reduced population. After the Louisiana Purchase the United States sent the Freeman and Custis expedition in 1805 to explore its new holdings along the Red River. That expedition reported the locations of abandoned villages along the river, with the Caddo survivors clustered around the U.S. trading factory at Natchitoches, Louisiana. These Caddo were soon removed by treaty to reservations in Oklahoma Indian Territory, where their descendents along with Delaware and other Indians with whom they have intermarried, are now known as the Caddo, a single sociopolitical entity that was formally established in 1874 (Story 1978).

The ethnohistoric record is very clear that for the period from 1687 to 1790, between the first definite recorded European visit to the Caddo living in the Great Bend region and their abandonment of it, the Arkansas portion of the Red River was inhabited by the Kadohadacho tribe. When the Freeman-Custis expedition traveled through the area in 1806 Kadohadacho guides told them that the abandoned village they saw somewhere between Fulton, Arkansas, and the Arkansas-Louisiana state line had been their largest with cultivated fields going for 8-10 km in every direction. Schambach (1982) noted the dispersed nature of Kadohadacho communities for great distances along the river. He presented the argument that the Cedar Grove site could have been a farmstead within an abandoned community represented by the Spirit Lake complex, a series of scattered mounds and farmsteads that extended along the Red River from Cedar Grove and Lester Bend to just north of Garland City, Arkansas.

RESEARCH VALUE

Much of the value of the investigations at Cedar Grove comes from the all too rare opportunity it has provided for comparing archeological evidence against the historic accounts of the Caddo, to see how closely the two kinds of evidence compare, contrast, or reinforce each other to provide new insights.

The variety of data recovered at Cedar Grove including stone and ceramic debris, soil samples, floral and faunal remains, ceramics, pigments, chronometric samples, evidence of settlement pattern, and human interments offered a chance to determine what the natural environment was like during the Caddo inhabitation, and how the people organized themselves in that natural surrounding. Later historic use of the same site was studied to help us understand how and why land use patterns changed over time. Such information is of importance to all people today who must cope with problems of an ever growing world population living on a planet with diminishing natural resources (Brown 1981).

Also significant is the fact that during the Caddo V time period relatively rapid changes occurred in the native culture as a result of exposure to European technology, ideology, and diseases. The greatest benefit of the research from Cedar Grove would have been an understanding of how human cultures react and adapt to such changes. This is germane in today's world, where we are constantly affected by technological innovations, and the interaction of worldwide variations in ideology and culture, which reshape both our physical and social environment. The continued health and well being of humanity will ultimately be dependent on how successfully we are able to comprehend and predict the impact of such changes.

Ideally the social scientist should have a broad range of comparable data from many different places and items to test models of human behavior. Such opportunities are rare in archeology, but investigations such as those undertaken at Cedar Grove provide important building blocks for this work in the future.

Therefore, this investigation of an abandoned Indian settlement, overlain by more recently buried historic occupation, will not just fill a gap in the chronology of the past, as interesting and important as that may be in itself. Rather, key elements of the Cedar Grove research were first to identify how past populations interacted with their natural environment, and secondly, if present, to determine what the effects of European contact were on native culture. We hope this information will be useful to an audience much larger than the immediate professional and avocational one interested in archeology and history.

Benefits such as these from the preservation and study of our cultural heritage were reasons behind the passage of federal legislation in the past decade that provides for the protection of cultural resources affected by modern land use. The federal regulations, rules, and orders provided the means to take advantage of the unique research opportunity afforded by the discovery of Cedar Grove.

REPORT ORGANIZATION

The following chapters cover first the research design of the project (Chapter 2) and then background chapters on local river morphology (Chapter 3), reconstruction of the natural vegetation at the time of the Caddo IV/V occupation (Chapter 4), the ethnohistoric context and a model for contact era archeological sites in the Great Bend region (Chapter 5), and the history of the area surrounding Cedar Grove (Chapter 6). The field and laboratory procedures are then outlined (Chapter 7) followed by the basic descriptions and assessment of the historic archeology component (Chapter 8), aboriginal settlement pattern (Chapter 9), and the aboriginal cemetery (Chapter 10). The next seven chapters provide specialist analyses of the data recovered, including aboriginal ceramics (Chapter 11), pigments (Chapter 12), subtractive technology (Chapter 13), floral remains (Chapter 14), faunal remains (Chapter 15), bioarcheology (Chapter 16), and chronometrics (Chapter 17). The final chapter reviews the findings and applies them against the ethnohistoric models outlined in Chapters 2 and 5, providing summary and conclusions on the interdisciplinary investigations of the Cedar Grove site.

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Chapter 2

RESEARCH GOALS

by Neal L. Trubowitz

No single scholar can command the wide diversity of skills necessary to fully extract the needed information from the silent prehistoric past. The addressing of modern anthropological issues using archeological data must be conducted in an interdisciplinary format. Such an approach characterizes the Cedar Grove project. In the following sections the program of research which was proposed by each specialization is briefly reviewed. These individuals (many of whom contributed to the text of this chapter*) and their interests are

Rainer Berger, radiocarbon assays
Elizabeth Coughlin, pigments
*Jonathon Ericson, pigments
Margaret Guccione, geomorphology
*E. Thomas Hemmings, geoarcheology, soils analysis
Michael Kaczor, soils analysis
*Marvin Kay, lithic analysis
*Frances King, floral analysis
John E. Miller III, ceramics
Sandra Parker, computer applications
*James R. Purdue, faunal analysis
*Jerome Rose, bioarcheology
Steven Rowlett, thermoluminescence dating
*Frank F. Schambach, ceramic analysis, southwest Arkansas archeology
Leslie Stewart-Abernathy, historic archeology
*Bonnie Whatley Styles, faunal analysis
*Neal L. Trubowitz, settlement systems, social organization, aboriginal/European contact
Beverly Watkins, history
*Daniel Wolfman, chronometrics

The late age of the Cedar Grove site provided a rare opportunity to compare archeological data against documentary information concerning the Caddo Indians when their culture was aboriginal, yet was increasingly subjected to changes brought about by European contact. On the basis of the early historic Teran map and the Soule photographs, anthropological studies of colonial records (Swanton 1942; Griffith 1954), and archeological data, Frank Schambach (1982:131) developed a model of settlement pattern and other archeological evidence that might be found on a late Caddo farmstead. This has been named the "Teran-Soule" model after the end documents that mark the period spanning 1691 to 1872.

The primary Cedar Grove project-specific goals were to investigate the Teran-Soule model after delimiting (1) how the Cedar Grove inhabitants adapted to their environment, and (2) how the introduction of foreign ideas, technology, and diseases may have affected their lifeways.

In order to investigate the Teran-Soule model it was first necessary to provide a basic archeological background on the local natural environment, and how the Caddo lifeway was organized to cope with both its natural and social environment. The model could then be compared against these data to determine if and how it applied, and then to assess whether European contact was affecting the Caddo. Since Cedar Grove was the first Caddo V farmstead ever to be systematically investigated in the Great Bend region of the Red River Valley, let alone in Arkansas, it provided the first data on that cultural period that until now has been terra incognita. This reinforced the need to provide a basic description and analysis of the different kinds of data recovered.

Specialist analyses were required to provide this basic information. Studies of the geomorphology, the flora and fauna, and certain pigments from the site help define the local natural environment, and how the Caddo inhabitants were exploiting it. Subsistence practices are further delimited by studies of the lithics and bone tools found on the site.

The specialist analyses also bear directly on the question of if and how European contact affected the Caddo. The analysis of the floral and faunal remains could provide direct evidence of European-introduced cultigens and domesticated animals, while study of the pigments found as human grave offerings and as decoration on ceramics would determine whether these pigments came from European trade.

Once the environmental information was studied, and the presence or absence of European contact was assessed from the multiple possible lines of evidence, these data were applied against the Teran-Soule model.

THE TERAN-SOULE MODEL

Schambach (1982) presented a comprehensive description of the data one might expect to find on a late Caddo farmstead based on the Teran-Soule model. Since it recently appeared in print elsewhere, it is paraphrased here. It is recommended that the reader examine the entire original as well.

The early document of the Teran-Soule model is a map of the Upper Nasoni village on the Red River which was visited between November 28 and December 2, 1691 by an expedition led by the Governor of Spanish Texas, Don Domingo Teran de los Rios. This map is as complete a drawing of a Caddoan village, which had little, if any, contact with Europeans, that will ever be found. It is one of the most frequently illustrated documents regarding Indians of the Southeast (Bolton 1915:frontispiece; Harrington 1920:Plate 20; Griffith 1954:frontispiece; Wedel 1978:Figure 2--reproduced here as Figure 2-1), but its interpretation value was largely unrealized until Schambach developed his model. This village has been correlated with the Hatchel-Mitchell-Moores complex in Bowie County, Texas (Wedel 1978). This map shows a community consisting of 23 farmsteads and other clusters of buildings dispersed along both sides of the active channel of the Red River and around two oxbow lakes for a distance of at least 5 km and probably somewhat more than 8 km. At

the western end of the village was the ceremonial center, a compound containing a mound with a temple on top and a brush or bark-covered arbor near the mound, but no other structures. To the east of the conspicuously vacant ceremonial center, approximately 2 km according to the Teran expedition narrative (Hatcher 1932:33), was the compound of the Caddi, an adolescent male who, considering his age, was almost certainly a chief in the formal anthropological sense of the term.

The farmsteads in this community are shown as small compounds, each consisting of one or two, and in one case three houses, one or two storage platforms with beehive-shaped grass-thatched covers or roofs and sometimes a wall-less structure supported by four posts. The latter could have been either ramadas or drying racks or both, since both types of structures are documented for historic period Caddo farmsteads. The Teran map also shows five structures or clusters of structures without storage platforms or ramadas or, it would appear, any surrounding fields. All of these are located along the two cutoff lakes shown on the map and they would appear to be special purpose buildings or compounds of some sort (Schambach 1982).

The photographs by Soule (Swanton 1942:Plate 14; Schambach 1982), shown here as Figures 2-2 and 2-3, provide a view of a Caddo camp in Oklahoma some 180 years after the Teran map (they were taken sometime between 1868 and 1872). The Soule photographs show basically the same structural details as the Teran map, of thatch-covered houses, storage structures, and open air ramadas or arbors. While the Caddo Indians in the Soule photographs are dressed in European clothing, they also wear graduated silver disks, called "moons" which were popular earlier in the century as illustrated in a watercolor of Caddo Indians in Texas ca. 1830 by Lino Sanchez y Tapia (Berlandier 1969:Plate 7). The similarity of the homestead structures between the Teran and Soule documents shows a remarkable retention of native settlement pattern by the Caddo despite long exposure to Europeans and their lifeways. Adoption of European goods and ways was made selectively by the Caddo, and therefore it was concluded that the documents provided an excellent diachronic basis for modeling Caddoan settlements despite nearly 200 year's difference in their age.

Schambach (1982) developed four questions or suppositions in the Teran-Soule model to take to the field as a guide to research. These questions contrasted farmsteads or compounds of upper class individuals such as the Caddi against those of the lower class, "normal" farmsteads. The basic farmstead lived on by the bulk of the population was modeled as having from one to three houses, one to two storage platforms, and in some cases a ramada. In terms of artifact remains, normal farmsteads were presumed to have a very low incidence of engraved fine ware pottery types, a high percentage of very large utility vessels for food preparation and storage, an absence of pipes and pipe fragments which were presumed to be used for ceremonial activities, and a high incidence of extractive and maintenance tools, particularly celts and celt fragments.

In contrast, the compound of the Caddi or other special function areas were postulated to lack storage platforms, have more than a single ramada, evidence of special or limited activities. They would also have the reverse situation from normal farmsteads in terms of the presence or relative abundance of fine ware and utility ceramics, pipes, and other ceremonials objects, and maintenance and extractive tools. Farmsteads belonging to chiefs or priests were also expected to exhibit a relatively limited range of food refuse bones because they were being supplied specific edibles by the rest of the population.

The model called attention to the presence or absence of deer antler as refuse due to deer ceremonialism which has been archeologically identified at Crenshaw, another Caddo site in the Great Bend region (Schambach 1971). This ceremonialism persisted into the contact era according to ethnohistoric documents (Griffith 1954:115-116). Details of Caddo structures were also outlined in the model. Normal farmstead houses were expected to exhibit a circular postmold pattern between 9 and 15 m in diameter, with posts each about 30 cm in diameter. Storage structures were expected to be about a third the size, also circular, with some 40 to 60 posts (each 10 cm in diameter) spaced every 40 cm around the circumference. Ramadas were modeled to be rectangular with six large posts either house wall size or somewhat larger. Spacing of these posts was suggested from the Soule photographs at about 1.5 m.

Finally, additional questions were outlined from archeological data which were not suggested in the Teran or Soule documents. The community social composition, whether there were age or sex differences manifested in burials according to their locations between and within settlements, the average distance between compounds, the total size of each farmstead and associated fields, the use life of a compound and amount of rebuilding present, and the presence or absence of craft specialization, were specified as information to be sought in examining late Caddo settlements in the Great Bend region.

THE CHAKANINA PHASE AND THE NATURE OF EUROPEAN CONTACT

The definition of the Chakanina phase (Schambach 1982) was based on the ceramic assemblage recovered in the test excavations at Cedar Grove, which is unique to our present knowledge in the Arkansas Great Bend region. By continuing the study of Cedar Grove, additional portions of the material culture and settlement pattern relating to this phase were expected to be defined, which could be compared against other late Caddo archeological manifestations, such as Belcher phase sites in Arkansas and Louisiana and Little River phase sites in northeast Texas.

As the Chakanina phase is presumed to date after European contact, the establishment of criteria for recognizing the archeological presence of such contact needs to be explicit. This is not simply a matter of recovering identifiable European trade goods in association with late Caddo aboriginal sites, as archeologists have commonly assumed. Rather, the interface of European and aboriginal cultures in the Caddoan region was expected to be more complex, involving both people and goods (diseases, livestock, cultigens, hardware, etc.) in varying amounts at different times. The pace and intensity of contact/interaction was variable from one Caddoan confederacy or tribe to another, and thus archeological manifestations of these contacts were also expected to be variable.

Therefore, an integral part of the Cedar Grove research was to establish a model for the nature of Indian/European contact in the Arkansas Great Bend region from the time of the first European contacts in the greater Caddoan area through the specific sequence of recorded contacts in the Spirit Lake locality. The model would then identify archeological implications. This newly developed model would provide the means of assessing the presence, if any, of European influence on the Cedar Grove inhabitants, and then to measure any resultant effects on aboriginal lifeways.

SPECIALIZED ANALYSES

While the broad issues guided the entire program of investigations at Cedar Grove, each specialization also addressed topic-specific questions. Such a focus on broad "community" goals while preserving specific specialist interests allow the most productive environment for interaction. The following sections present a synopsis of each of the specialist's studies--based on the individual proposals originally submitted by the program participants.

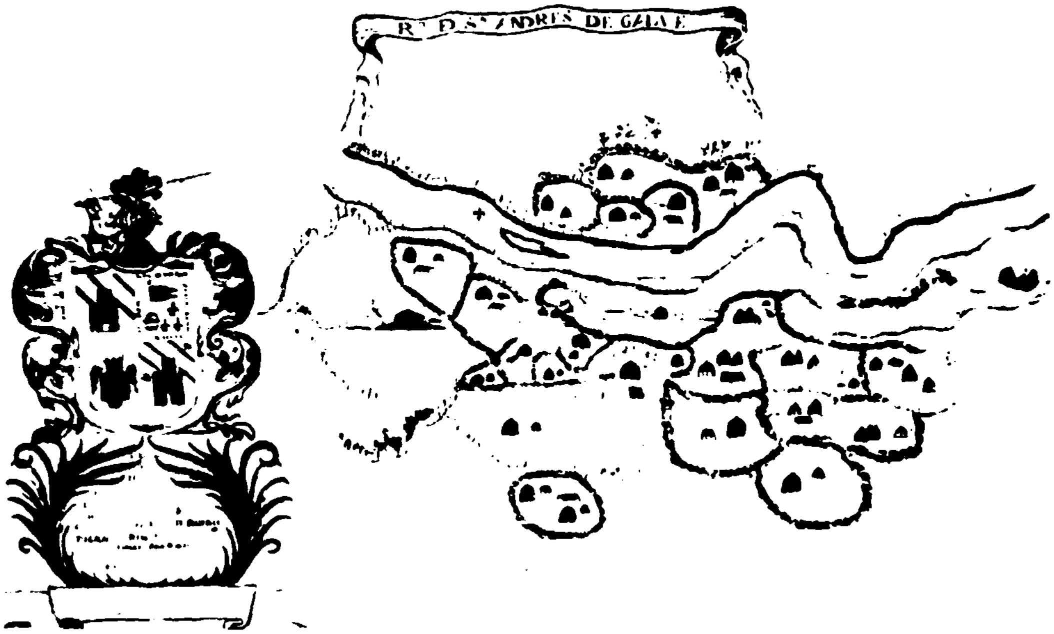

Figure 2-1. The Teran map showing a Caddo community along the Red River (original in Achivo General de Indias, Seville)

Figure 2-2. "Long Hat's Camp," a Soule photograph of a Caddo farmstead in eastern Oklahoma, 1868-1872, frontal view (Courtesy of the Smithsonian Institution)

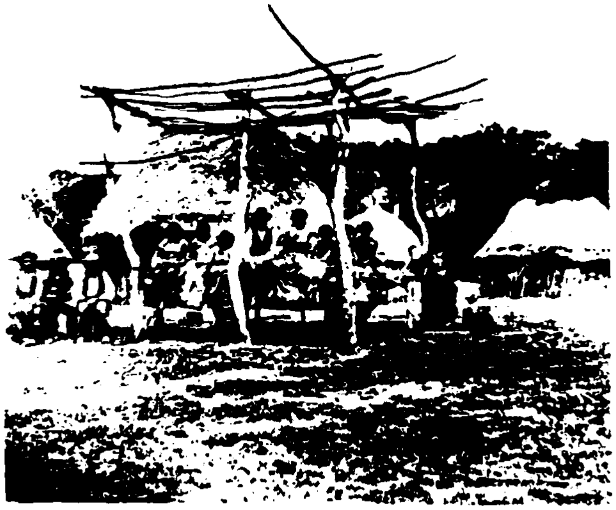

Figure 2-3. "Long Hat's Camp," a Soule photograph of a Caddo farmstead in eastern Oklahoma, 1868-1872, view from the right front (Courtesy of the Smithsonian Institution)

Geomorphology

The contribution of earth sciences to prehistoric archeology in North America has increased rapidly in the last decade. This increase features a set of techniques and concepts (geoarcheology) which can assist the archeologist in rigorously evaluating the past environmental context of a site, a locality, or a region (Butzer 1977a; Gladfelter 1977; Davidson and Shackley 1973). Butzer (1980) stresses that paleoenvironmental techniques and data have increased by an order of magnitude and that an integrated approach to studying past human ecosystems, called "contextual archeology," has emerged. Butzer (1977b) has applied this contextual approach to the Koster site and other alluvial sites in the lower Illinois Valley.

Within this framework, geomorphological research proposed to identify fluvial processes which operated in the Red River reach immediately below the Great Bend during and following the Cedar Grove site occupation. Variables to be measured on successive map or aerial photo series were to include meander radius, wavelength, amplitude, sinuosity, channel width, and perhaps channel length (Leopold et al. 1964).

It was further proposed that the geomorphological studies identify channel pattern trend between 1822 and 1976 for the project area and region, which have significance for cultural resource management. These data would help predict the locations of similarly buried sites, both those extant and those lost to river erosion. The geomorphological analysis of the Cedar Grove site and its floodplain locale also had the goals of recognition of terrain elements included in the behavioral environment of the Caddo IV/V community and the delineation of natural processes that have subsequently affected the archeological record. The analysis was then to be integrated with other project analyses of environmental and cultural data to the benefit of contextual archeology in the Red River Valley of Arkansas.

Floral and Faunal Analyses

The basic aims of the proposed study of the floral and faunal remains were to (1) provide an environmental backdrop for discussion of the subsistence and settlement patterns of the Caddo community, (2) establish which habitats and resources were most heavily utilized, (3) examine remains for direct evidence of European influence, and (4) itemize remains associated with human burials.

Vegetational Reconstruction and Floral Analysis. Reconstruction of the environment in which a human group lived is essential to understanding why they chose to settle where they did, why they chose to exploit certain wild plant and animal resources before others, or why they undertook the cultivation of specific plants at a given time or in a certain manner distinct from that of other groups.

While use of the General Land Office survey data often poses many problems for such a reconstruction (Wood 1976; King 1978; King and Graham 1981), it is unusually relevant for the Cedar Grove site since the site was occupied in the seventeenth and eighteenth centuries and the land surveys were done in the early nineteenth century. Environmental reconstruction of the locality may give some insights into placement of habitation sites and the availability to various types of plant resources associated with different vegetational communities.

Specific questions to be answered by analysis of the botanical remains included the relative importance of wild plant foods versus native and introduced domesticates such as maize, sunflower, squash and bottle gourd. The recovery of maize from the area's sites is of particular interest because of its obvious importance to Mississippian groups elsewhere while bioanthropological evidence suggests that it may have been much less important to inhabitants of the Cedar Grove site. Information on the relative frequency and abundance of maize would be helpful in interpreting and discussing biological data from trace element and carbon isotope analysis. Plant food preparation techniques suggested by dental characteristics (dental pathology and microwear) can also be tested by the quantification and description of plant food remains.

In addition, a number of Old World plant domesticates, notably peach (Prunus persica) and watermelon (Citrullus vulgaris) became widely distributed shortly after European contact. The presence of such cultigens in the Cedar Grove site would be significant in that, like the presence of other European items, it would demonstrate suspected European contact on late Caddo culture in the area.

Identification of wood charcoal taxa also adds to knowledge of the environment and intrasite variability in plant usage. For example, certain wood species may have been preferred for certain functions, such as drying meat or tanning hides, as opposed to probable lack of discrimination in collecting wood for fuel purposes.

Faunal Analysis. The proposed faunal analysis was structured to satisfy the overall research design for Cedar Grove by primarily examining prehistoric resource selection and secondarily itemizing fauna directly associated with human burials.

The following foci were proposed:

1. The relative importance of fauna derived from major habitats (e.g., forest versus prairie, upland versus floodplain, terrestrial versus aquatic) was to be determined. It is necessary to carefully consider, through discrete tabulations, the distribution of fauna on the site because previous study provides evidence for differential deposition of bone in midden and features (Styles 1981). Screened and floated samples were to be treated separately so the proper controls could be maintained for subsequent evaluation of the size of prey species.

2. Localization of resource exploitation was to be examined. Previous study of early Late Woodland sites in the lower Illinois River Valley has indicated localization in the exploitation of fish and freshwater mussels (Styles 1981). The location of Cedar Grove in the floodplain of the Red River provides an interesting spatial and temporal comparison for the evaluation of localization.

3. Faunal indicators for season of kill were to be evaluated as well as body part representation for the large species such as white-tailed deer. These data provide clues to the degree of specialization in subsistence pursuits, on-site activities, and ultimately site function.

4. Processing activities (e.g., butchering, cooking, marrow extractions) within and between site components were to be evaluated.

5. Faunal materials from human burials were to be itemized and compared to published accounts of those from other sites in or near the Red River Valley.

6. Evidence for European influence was to be sought by examining faunal remains for domestic animals known to be associated with early settlers (pig, horse).

7. Finally, empirical evidence was to be integrated with data and interpretations generated by other members of the research team, particularly that of the bioarcheological study.

Ceramics

Because ceramics are among the most abundant remains found on late prehistoric and early historic aboriginal sites, and as their decorative treatment, vessel form, and construction techniques (i.e., tempering materials) vary over time and space, they are a key element in all Caddoan archeology. Many changes in Caddoan chronology have been first based upon the variations in ceramic assemblages, as was the case in the definition of the Chakanina phase at Cedar Grove (Schambach et al. 1982). The Cedar Grove IV/V assemblage represented an exceptionally tight ceramic collection.

Analysis of the ceramics at Cedar Grove provides information beyond chronological placement, including data relevant to evaluation of the social status of the occupants (see Teran-Soule model above) and the nature of the occupation, whether it was domestic or otherwise. The sturdy construction and artistry of the decorations on Caddo ceramics is as fine as any other Southeastern Indians'; this factor was probably important in the persistence of native ceramics long after European vessels became available. It also probably led to the use of Caddoan pottery as trade goods, which have turned up in locations remote from the places where these vessels were produced, as in the collections from the Trudeau site in West Feliciana Parish, Louisiana (Brain 1979:245).

The ceramics at Cedar Grove were to be identified using the standard reference for this work, the Handbook of Texas Archeology (Suhm and Jelks 1962). However, previous work in the region (Schambach 1981), has demonstrated that such an approach does not permit representation of the full range of variability present in the ceramics. As a result the "collegiate" system developed by Schambach will also be used in the ceramic investigation. Studies of ceramic distribution across the site, especially their inclusion in aboriginal graves would provide the data on the nature of the occupation and the status of the inhabitants, as well as information on possible diachronic changes in site use horizontally. Comparison in detail to other ceramic collections in the Great Bend area and the broader Caddoan archeological region would help assess the contact of the Cedar Grove inhabitants with the wider circle of native peoples and their European counterparts in the Trans-Mississippi South.

Pigment Analysis

The use of pigments in the decoration of Caddoan ceramics is one of their primary characteristics. Both white and red pigments were found smeared into the incised lines of the ceramics at Cedar Grove, sometimes on the same vessel. On some of the ceramics recovered in the aboriginal burials it was also evident that the entire body of the vessel had been covered with pigment, and not just rubbed into the lines. The use of red and green pigments in themselves as grave goods was identified. Mussel shells were used as containers for the pigments.

Study of these pigments was proposed to contribute information important to several of the study themes current in southwest Arkansas archeology, as well as contributing to the attainment of the project-specific research goals of learning if and how European contact may have affected the Caddo. As a decoration on ceramics, pigments were an important medium of Caddo art. The inclusion of the pigments as grave offerings also denotes their having had symbolic importance to the Caddo in their religious and social organization. Pigments became important as a trade good after contact with Europeans. The French supplied vermilion (Gregory 1973) and possibly white lead to southeastern Indians (Schambach, personal communication). As the Caddo used pigments to decorate their bodies, any use of white lead may have profoundly affected their health and survival.

Pigment analysis was to be used to determine the origin of the pigments, whether native or European. A combination of techniques, x-ray diffraction and microchemical, were proposed. The mineralogical/crystalline form of the materials was to be determined through x-ray diffraction, which is combined with microanalytical analysis for qualitative results.

Determination of a possible European origin would provide additional confirmation of the site as a late Caddo V component and assist comparison with other sites that have yielded European vermilion or other pigments. At present archeological evidence of pigments on Caddo sites in print other than those on ceramics, is limited primarily to that provided by Gregory (1973) and his listing of known eighteenth century Caddo sites. Two sites in the Sabine River Valley, Ware Acres and Millsey Williamson, have yielded vermilion offerings in graves, and green pigment was found at the C. D. Marsh site, also in the Sabine drainage in Texas. All three of these sites contained the pottery type Natchitoches Engraved, which was found in both the midden and burials at Cedar Grove.

The identification of the pigments was proposed to help fulfill our project goals of assessing European contact effects on the Caddo, provide information on the research themes of art, religion, and social structure, and establish a comparative base against other Caddo sites that have yielded pigments.

Lithics

Cedar Grove represents a nearly novel opportunity for an integrated study of a Caddoan settlement due to both its rapid and seemingly complete burial by overbank deposits of the Red River and a reasonably comprehensive field sampling program designed to isolate both diachronic and synchronic intrasite variation in kinds and amounts of Caddoan debris classes and architectural features. Thus, the purpose of the stone artifact studies were to provide the descriptive information on stone tool technology and use for integration with similar data for other categories of material remains, notably bone and shell tools, and their intepretation for Cedar Grove.

The proposed analysis of these materials was to follow the general lithic reduction and use model defined by Collins (1975), as stone tool production is a subtractive process separable into several analytical steps or stages and tool use often involved more than utilitarian considerations (Binford 1962). A prominent subset of the lithic sample, for instance, comes from the human burials at Cedar Grove. The lithic artifacts found with the burials may represent tools used by the buried individual, items that signify a special status or ranking, or—in a few instances—perhaps weapons responsible for an individual's death. It was expected that similar differences in tool use would be present in functionally contrasting site areas such as the Cedar Grove middens and residential units. In the latter units perhaps it was expected that tool use and production follow a more strictly utilitarian path.

The analysis proposed to:

1. Sort lithic artifacts by functional debris categories such as waste byproducts of manufacture and tool elements;
2. Identify source materials represented in the lithic debris subsamples, quantify proportions of various material types by artifact categories and site context;
3. Assess variability in manufacture technologies for ground and chipped stone artifacts;
4. For utilitarian artifacts, examine tool edges and surfaces for evidence of modification due to use and make suggestions for a more detailed microwear study based on replication experiments using similar stone materials and tool templates for specific artifact types such as pottery engraving tools, etc.;
5. Assess bias in the artifact sample due to field recovery procedures, postdepositional disturbance, or selectivity on the part of the Caddoan inhabitants of Cedar Grove.

Bioarcheology

During the past decade the emphasis on ecological research by anthropologists has revolutionized the analysis of prehistoric skeletal material. Where once osteologists were content to produce descriptive analyses of prehistoric skeletal remains, they are now concerned with the question of adaptive efficiency of prehistoric cultures. These specialists, calling themselves bioarcheologists, are using biological data to test archeologically derived hypotheses. Within the past few years bioarcheology has sufficiently

matured to the point where theoretical models are being derived for testing with archeological data. One model states that the adaptive efficiency of local segments of a single culture will vary in direct relationship to the ecological diversity of its geographic range. The prehistoric Caddo cultural tradition of Oklahoma, Arkansas, Texas, and Louisiana provides an ideal laboratory for developing and testing this model.

The Cedar Grove site was concluded to have the potential to make a significant contribution to our understanding of Caddo ecology and adaptive efficiency. Although the sample size is small, the Cedar Grove skeletal series is typical of sites of its age and is exceptionally well preserved. This site was ideal for bioarcheological analysis because of the sampling design, excavation procedures, and the ecological orientation of the proposed analysis. For these reasons the Cedar Grove material deserved intensive analysis and integration with all extant Caddo bioarcheological data.

The Cedar Grove bioarcheology research design emphasized three focal areas of investigation: paleodemography, paleopathology, and dietary reconstruction.

The first bioarcheological goal was to define the burial program and social structure of the Cedar Grove site. The demographic distribution of the Cedar Grove burials were to be compared to demographic standards (both theoretical and from other Caddo sites) to determine if it was representative of the expected dead of a small farmstead. The social structure was to be reconstructed with reference to grave goods, demographic parameters, and paleopathology. Both nonmetric and metric dental and skeletal data were to be collected to discuss biological relationships between individuals. Specifically, if the archeological data indicated close temporal associations between the individual burials, the genetic data were to be used to test the hypothesis that these clusters showed greater biological homogeneity than would be typical of large Caddo skeletal series. These data were then to be used to evaluate the presence of a single kinship group. This hypothesis was to be tested by the presence of clustered skeletal and dental traits.

The second bioarcheological goal was dietary reconstruction of the Cedar Grove skeletal collection. Specifically, the hypothesis that the Cedar Grove diet was dependent on maize was to be tested. It has been alternatively suggested that the Caddo were dependent on maize for a substantial proportion of their diet or that they had a mixed subsistence economy. Nutritional adequacy was to be tested by analysis of the following: porotic hyperostosis, sexual dimorphism, long bone growth, and osteoporosis. The amounts of plant fiber and carbohydrates were to be estimated from the dental pathology and microwear data.

Because of the complex interrelationship between diet and disease, all paleonutritional data were to be evaluated in light of the paleopathology data. All paleonutritional data were to be evaluated in comparison to other Caddo skeletal series and integrated with all applicable data from the Cedar Grove site.

The third bioarcheological goal was to assess the adaptive fitness of the Cedar Grove people within their specific ecological (both social and environmental) context. Although the skeletal sample is small, the sampling strategy during excavation was sufficient to assure almost complete recovery in the direct impact zone. Consequently this skeletal series was considered sufficient to estimate adaptive efficiency relative to previously excavated Caddo skeletal series. The three levels of analysis proposed were evaluation of mortality profiles with comparison to both standard life tables and other Caddo series, childhood stress patterns, and adult morbidity rates with comparison to other Caddo and non-Caddo skeletal series.

The fourth bioarcheological goal was to effectively integrate the skeletal data with that obtained from the archeological, paleobotanical and paleozoological analyses. The Cedar Grove project offered the first opportunity in Arkansas to perform skeletal analysis in a feedback relationship with all other specialized analyses.

The fifth bioarcheological goal was to effectively integrate the Cedar Grove data with all extant Caddo bioarcheological data. As most Caddo osteological analyses exist only in manuscript form, a special effort was to be made to collect and collate all applicable data for comparison with Cedar Grove.

The sixth proposed bioarcheological goal was to determine whether there is any evidence of European contact in the skeletal series from Cedar Grove.

Chronometric Analyses

The objectives of chronometric analyses in archeology today do not amount simply to placing the site within an absolute time scale, although this is the principal and most obvious result of different dating techniques. Although early attempts at dating had to be satisfied with establishing relatively broad occupation spans, which forced the archeologist to deal with the site as an synchronic episode of stable cultural patterns, today there are a variety of complementary chronometric techniques, which permit more refined definition of different settlement and activity patterns. Narrowing the chronometric placement of portions of an archeological site to a span of several decades, rather than hundreds of years, improves our capabilities of assessing past lifeways as a dynamic cultural process. Thus in addition to placing 3LA97 within an absolute time frame, we also wished to study changes within the settlement through time for the perspective this will reveal on the interaction of the Caddoan inhabitants with their social and natural environment. As Michels (1973:20) pointed out in his text on archeological dating:

> Time is a continuum that is structured by events, and dating is our effort at chronicling these events. The more accurate and the more specific our chronicle, the more fruitful will be our search for explanations of cultural change.

Therefore, as detailed below, a variety of chronometric methods (archeomagnetic, radiocarbon, and thermoluminescence) were proposed.

As has been noted many times, no chronometric method is free from problems and potential errors. Each method has problems for which compensation can be made by processing multiple samples and comparing the results from independent methods:

> it is desirable to base the dating of a culture phase on as many different types of samples from as many different types of sites as possible. 'One date is no date.' (Aitken 1974:78)

Suites of at least three dates on each chronometric provenience provide minimal statistical reliability for each dating technique. It is only in this manner that archeologists can be assured of accurate results.

Archeomagnetic Dating. Archeological dating of the seventeenth and eighteenth centuries presents several problems. Dendrochronology, when the proper samples are available in a region whose master chronologies have been developed, is unquestionably the best approach. While master chronologies for several species have been developed in Arkansas as far back as the fifteenth century, suitable samples, unfortunately, were not recovered from the Cedar Grove excavations. In the absence of dendrochronology the most precise and accurate chronometric method is archeomagnetism. In many instances it is possible to obtain archeomagnetic dates with a precision in the order of $\pm$ 20 to 40 years at the 95% confidence level.

At Cedar Grove the problem of applying archeomagnetic dating was the reverse of that presented by dendrochronology; a sample was collected from a well baked hearth, but a master curve for the general time of site occupation for the region has not yet been developed. Master curves exist from A.D. 1200 to 1500 (Wolfman 1979) based on archeological samples and from A.D. 1819 to the present on the basis of observatory records. The path of the master polar curve between 1500 and 1819 remains to be discovered by measuring archeomagnetic samples (at least some of which must be independently dated) from protohistoric and historic sites. Thus, it was hoped that the results from the archeomagnetic sample recovered from Cedar Grove would serve two purposes. It would help in the construction of the curve in this crucial time period, and when the curve is developed and calibrated it would provide an accurate date for the structure from which the sample was collected. Discussions of the archeomagnetic dating method have recently been presented by Wolfman (1979, 1983) and Eighmy et al. (1980).

Radiocarbon Dating. The most widely used chronometric method in American archeology is radiocarbon dating. However, due to rapid variation in the C-14 content of the atmosphere in the sixteenth through eighteenth centuries this method must be used with great care to obtain the greatest possible accuracy when working with samples from that time period. In some situations the processing of multiple C-14 samples can alleviate this problem. Due to the variety of charcoal samples and burials recovered at Cedar Grove it was considered possible to obtain multiple C-14 determinations for each of the several settlement pattern components at the site and resolve some of the potential problems when applying C-14 dating in this time frame.

Carbon-13/carbon-12 ratios were to be determined to improve the accuracy of the C-14 assay on all samples. These studies would also provide the necessary preparation for strontium content analysis of the human bone, which would mesh with the bioarcheological analyses on the diet of the aboriginal Cedar Grove inhabitants; the strontium tests specifically would provide an evaluation of the use of animal products in the Caddoan diet, indirectly determining the importance of cultigens such as maize.

Radiocarbon assay of many samples from the different burial components would help determine whether these groups reflect some cultural patterning and provide information on settlement variation through time across the site from north to south. Although there has been some discussion about the reliability of C-14 dating of bone, in a recent reassessment of the possible difficulties which might be encountered in dating this material, Taylor and Slota (1979:430) concluded that "bone samples can be routinely utilized in radiocarbon studies if proper pretreatment procedures are applied."

Thermoluminescence Dating. The only other archeological dating method that can be used for the time range of the Cedar Grove occupation is thermoluminescence (TL). While numerous difficulties were encountered during the development of this method, research has advanced to a point where, in many situations, reliable thermoluminescence dates can be obtained. In recent years thermoluminescence dating has been used with increasing frequency both independently and in conjunction with radiocarbon results to resolve chronometric problems. Only very recently have a few laboratories begun accepting some samples on a contract basis. A good general discussion of TL dating have been presented by Aitken (1974) and Seeley (1975).

While most archeologists think of thermoluminescence as a single method, in fact two different thermoluminescence related phenomena can be used to determine archeological ages. The traditional method involves measuring energy stored in crystalline material since it was either formed or last heated above 500 degrees C. However, no suitable samples were recovered with adequate quartz content.

The second method of thermoluminescence dating is based on measuring the stored energy in shell. Despite the relatively weak TL signal obtained, Ralph Rowlett (1980) at the University of Missouri has obtained very consistent thermoluminescence dates of shell temper extracted from Fort Ancient potsherds dating between A.D. 1400 and 1600. Based on this previous work he believed it would be possible to obtain a sufficiently strong thermoluminescence signal for similar samples, such as those found at Cedar Grove. To correct for single sample dating errors three sherds from each sampled provenience were run to produce a sound date estimate.

Chronometric Summary. In combination, the variety of chronometric techniques that were proposed for the recovered archeological samples provide a suite of comparative dates that would permit a detailed assessment of the internal chronology and settlement patterning, place 3LA97 within a dated time scale, and provide age ranges for the various ceramic and projectile point types that were found in direct association with the material being dated. The different chronometric techniques and multiple samples complement each other, negating problems often associated with the dating of sites as recent as Cedar Grove. The dating of contemporary samples of different materials from single features would help refine any correction factors required, and the archeomagnetic sample would add to the completion of the polar curve for the protohistoric period in Arkansas. The Cedar Grove site provided samples with the potential to yield chronological information important to the study of prehistoric lifeways and human behavior, as well as a set of absolute dates for a single site that would significantly augment the archeological dating record for Arkansas and the surrounding areas in northern Louisiana and eastern Texas.

Documentary and Historical Archeological Research

Although the effort was more limited than that expended on the extensive Caddoan occupation, attention was given to the historic occupants through documentary and informant research which was designed to provide an outline of local historical developments and their relationship to broader regional trends.

Assessment of the construction techniques of the levee, roadbed, and cemetery was important to determine how these features incorporated, destroyed, or protected portions of the aboriginal midden. Both documentary research and historic artifacts of known manufacturing date were sought in order to provide dates of historic usage of the Cedar Grove site.

Also sought was information on the variation in the landscape during the different occupations (if any) and how different cultures made use of a basically similar environment. Such diachronic data are one of the products of archeology that cannot be duplicated by other social sciences.

SUMMARY

As noted so often above, the key element in achieving the assorted research goals under each subtopic, is their incorporation and integration in an overall summary, meeting the project's objectives of testing the Teran-Soule model, identifying the interaction of the Caddo and historic occupants with their environment, and assessing the effects, if any, of European contact on the Caddo. We hoped to integrate the varying data and research conclusions to present a coherent picture of the prehistory and early history of Cedar Grove.

While pursuing our project research goals, we also have an obligation to those that follow us to structure our data analysis such that it will be of use or reuse for further research. This is particularly important when the archeological site being investigated, or a portion thereof such as at Cedar Grove, will be forever removed from future field study by construction activities or natural erosion. Although the investigating scientists may have project-specific research goals in mind, the research requirements of other scholars, both present and future, must be considered. Such problems are addressed by responsibly collecting and reporting the broad spectrum of available data, given the current state-of-the-art in archeology, and the constraints under which the project proceeds.

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Chapter 3

VARIATIONS OF THE RED RIVER CHANNEL IN SOUTHWEST ARKANSAS

Margaret J. Guccione

INTRODUCTION

The Red River of southwestern Arkansas has its headwaters in the High Plains of eastern New Mexico. It flows across the southcentral United States, forming the boundary of Texas and Oklahoma and Texas and Arkansas. Here it flows over Permian red beds, the source of much sediment and the name of the river, and the Cretaceous and Tertiary rock of the Gulf Coastal Plains. In southwestern Arkansas the river abruptly turns south, forming the Great Bend, and flows into Louisiana (Figure 3-1). In its lower reaches the Red River flows southeast and empties into the Mississippi River in southern Louisiana.

Previous work on the Red River Valley in Arkansas has attempted to date portions of the valley using the age of archeological sites (Pearson 1982) and to quantify meander morphology and channel geometry (Abington 1973). Some of the land surface within the valley is greater than 3,000 years old, but much of the land surface (point bars associated with the present and recently abandoned meander bends) within the modern meander belt is less than 400 years old (Pearson 1982). It is this youngest segment of the valley that the present study examines. The channel changes within the historic record are examined in more detail than Abington (1973) could examine them and the possible prehistoric position of Lester Bend (Cedar Grove and Senteli sites) is considered.

The Red River in Arkansas is an excellent site to evaluate causes of river channel migration and to test the hypothesis that man's influence has significantly modified the river regime. Maps showing channel patterns are available at approximately 20 year intervals beginning in 1827. The earliest maps show the river before extensive influence by man. Historical projects that might have influenced the river morphology include clearing the native vegetation and extensive agriculture begun in the 1850s, clearing of the Great Raft in northern Louisiana in 1838 and again in 1843 and 1873, private levees built along some of the plantations before 1887, a continuous levee system built by the Army Corps of Engineers in 1873-1898, and the closure of Denison Dam, 300 km upstream from the Arkansas and Texas state line in 1943.

If man's influence has not extensively modified the regime of the Red River in southwestern Arkansas, the spatial and temporal variations present can be used as a basis for understanding the variations that might have occurred in the few centuries prior to mapping and what variations to expect in the future. If man's influence has extensively modified the channel patterns, then only those variations that existed prior to his influence can be used for making conclusions about the previous behavior of the river. The purpose of this study, which is part of a larger study of a late Caddo Indian farmstead on the Red River in southwestern Arkansas, is threefold. First the historic hydrology, channel morphology, channel patterns, and sedimentary processes of the river were examined to determine their temporal and spatial variations. Second, some possible causes of these variations are examined.

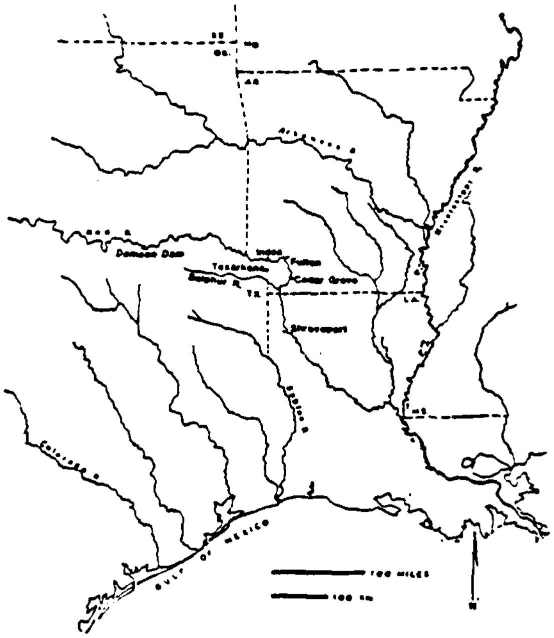

Figure 3-1. Location of the study area and Cedar Grove site

Finally, possible channel and floodplain positions near the Cedar Grove site were determined for several centuries prior to the earliest maps of the area to establish the use that the Caddo Indians might have made of their immediate environment and the limitation of that environment. Thus the question of man's influence on the channel morphology must be addressed before making conclusions about the channel morphology two centuries prior to the first maps of the area.

STUDY AREA

This report is concerned with that stretch of the Red River which makes up and is between the western and southern boundaries of the state of Arkansas. The Cedar Grove site is south of the Great Bend, approximately 29 km due north of the Arkansas and Louisiana state line. It is located within Lester Bend, on the south side of the northern meander limb (Figure 3-1).

METHODS

This report makes use of historic data from numerous sources. Hydrologic data, including the discharge and stage height, are available at three gauging stations, Index and Fulton in Arkansas and Shreveport in Louisiana. Information on both the stream width and depth was acquired from published soundings made by the Army Corps of Engineers (1968-1969) and historic reports (Hatcher 1932). All maps listed in Table 3-1 were used to quantify channel patterns and the three most recent maps were used to measure stream width. Suspended and bed load data were obtained for Louisiana by the U.S. Army Corps of Engineers in 1980 and size analyses of recent sediments are available for the Cedar Grove and Sentell sites (Appendixes I-III).

The elevation and gradient of the Red River during the last 65 years was determined by discharge and stage height records. The mean elevation of the river during the month of January for every other year since 1915 at Fulton and since 1926 at Index, Arkansas was graphed against time to determine if trends in river elevation change were evident. In addition, the discharge (m^3/sec.) was plotted against gauge height for several years. This also indicates any change in stream elevation through time. The gradient of the river was calculated using these river elevations and the river length, which was measured on maps of the same age.

Measurement of channel width and depth was standardized by estimating values at bank-full discharge. Channel width was measured as the width of the channel plus any adjacent unvegetated sand bars at the cut bank of each meander bend. To determine the width:depth ratio of the river, the width of the channel between permanently vegetated stretches was measured both at and between meander bends. At these locations the lowest elevation within the channel was subtracted from the elevation at the base of the vegetation to determine the depth.

Quantification of channel patterns included the meander wave length and amplitude, and the sinuosity. Because of the complexity of the meanders, the meander geometry of Leopold et al. (1964) was modified as follows. The meander wave length is considered to be the straightline distance, projected to the strike of the valley, between one meander cutbank (Figure 3-2, point A) and the third meander cutback (point B) downstream. The meander amplitude is the shortest distance between the channel center at the axis of one meander bend (Figure 3-3, point A) and a straight line joining the channel centers at the axes of the two adjacent meander bends (points B and C). Both the meander wave length and amplitude were measured for each meander on each map throughout the study area

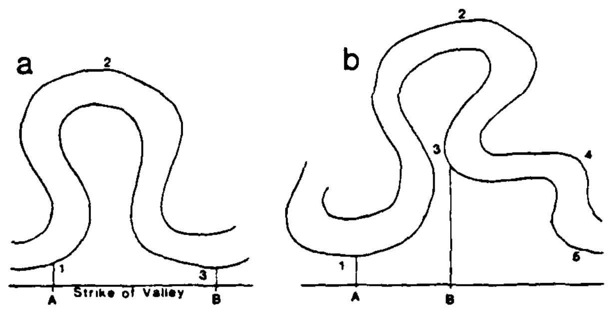

Figure 3-2. Measurement of meander wavelength of (a) a simple meander and (b) a complex meander that has second order meanders superimposed on a first order meander

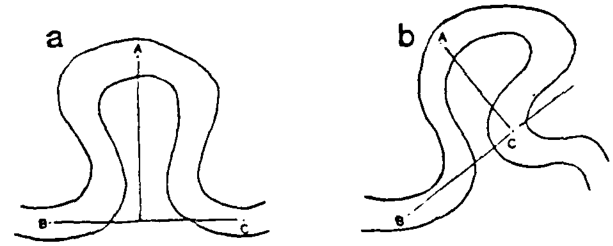

Figure 3-3. Measurement of meander amplitude of (a) simple meander and (b) a complex meander that has second order meanders superimposed on a first order meander

Table 3-1. Maps used in this chapter

Date	Source	Scale	Comments
1827	Browne and Barcroft	1:982,000	Upstream from Great Bend, map is not accurate; downstream, it may be accurate enough to quantify channel patterns
1844	Morse and Breese	1:1,451,000	River channels match some abandoned channels. May be reasonably accurate but not enough to quantify channel patterns
1865	Department of Transportation, U.S. Army Corps of Engineers, R. M. Venable	1:253,000	Appears to be reasonably accurate
1882	Colton's New Sectional Map, General Land	1:633,000	Apnears to be reasonably accurate
1901	General Land Office, Harry King	1:760,000	Appears to be reasonably accurate
1914	General Land Offcie, I. P. Berthrong	1:760,000	Appears to be reasonably accurate
1921	Ohman's Standard New Map	1:670,000	Appears to be reasonably accurate
1945	U.S. Army Corps of Engineers	1:62,000	Only available downstream; accurate
1951	U.S. Geological Survey	1:24,000	Drainage information from 1948 aerial photos; accurate
1975	U.S. Geological Survey	1:24,000	Photorevision of 1951 map; accurate

and a running mean of five measurements was used. The sinuosity of the channel is the length of the channel divided by the length of the valley. Sinuosity was measured along segments of the river, between intersections of the contour lines (10 foot contour interval on the 1951 topographic maps) and the river, and for the entire length of the river in Arkansas, starting near the Oklahoma and Arkansas state line and ending near the Arkansas and Louisiana state line (Figure 3-4). The sinuosity of the river on all other maps was measured along the same segments as on the 1951 map.

Most of the sediment size analyses (by Kaczor, Appendix II) included only the sand (0.05-2.0 mm), silt (0.002-0.05 mm), and clay (less than 0.002 mm) fractions. Analyses were made by the standard hydrometer methods described by Day (1965) and modified by Gee and Bauder (1979). A few samples were analyzed for five sand fractions, three silt fractions, and one clay fraction.

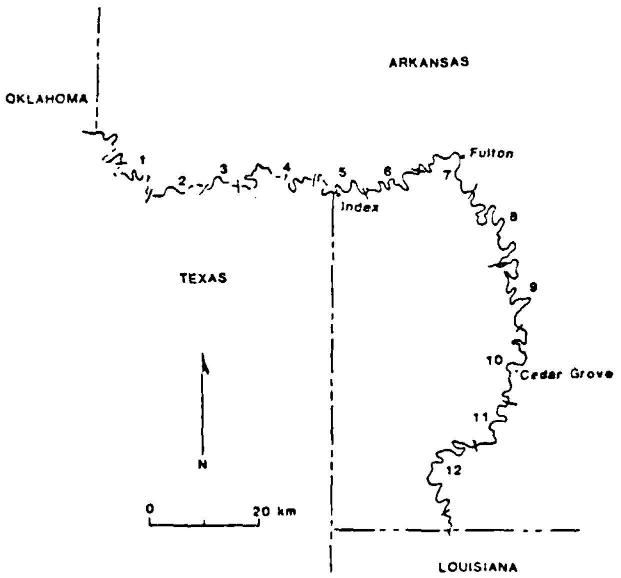

Figure 3-4. Location of the 12 segments along the Red River that are used in this report

Table 3-2. Discharge along the Red River, Arkansas

Index				
Maximum	2/23/38	8410 m^3/s	10.439 m	75.246 m
Minimum	11/28/56	10.7 m^3/s		
Mean	44 years	328 m^3/s		
Fulton				
Maximum	2/24/38	9570 m^3/s	79.672 m	68.562 m
Minimum	10/26/56	11 m^3/s		
Mean	53 years	490 m^3/s		

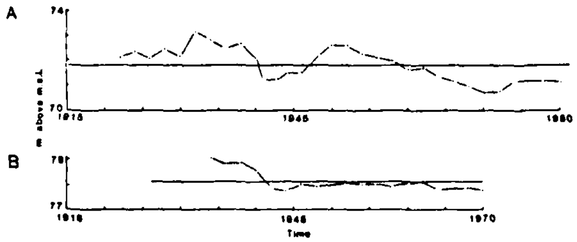

Figure 3-5. Mean January stage height of the Red River at Fulton (A) and Index (B), Arkansas. Each point is a mean of the five previous years. Horizontal lines are the means, 71.8 m (A) and 78.1 m (B) of years 1915-1980 (A) and 1926-1970 (B)

RED RIVER

Hydrology

The mean annual discharge of the Red River has remained nearly constant over four decades of record (Table 3-2; Abington 1973:70). Naturally peak discharges along the river have varied and floods occurred in 1892, 1908, 1915, 1920, 1927, 1935, 1938, and 1945 (U.S. Army Corps of Engineers 1961). It was during the 1927 flood that a crevasse splay occurred at Cedar Grove and covered the area with 1.2 m of sediment.

The elevation of the Red River at Shreveport, Louisiana has also remained constant since the 1920s, though the variability decreased in the early 1940s (Abington 1973:74). This decrease may be the result of closing Denison Dam in 1934. In Arkansas the gauge heights at Fulton and Index also show a decrease in variability since the 1940s, but the elevation has not remained constant. At Fulton the mean stage height since 1964 is 1.3 m lower than the mean stage height before 1964 (Figure 3-5). At Index the trend is similar to that at Fulton, but the difference in elevation is slightly less. The elevation of the river at the same discharge also indicates that the river elevation has decreased during the last few decades (Figure 3-6).

The gradient of the Red River decreases downstream, as expected, and it also has decreased with time between Index and Fulton, Arkansas. Most of the gradient decrease through time is due to increased sinuosity because the difference in river elevation between Index and Fulton has remained approximately constant since 1926 (Figure 3-7). If this difference in elevation was similar between 1914 and 1926, (this assumption seems reasonable because the maps are only 12 years older than the data available on the river elevation), then the gradient of the Red River in 1914 and 1921 was about the same as it was in 1948 (Figure 3-8). Thus the gradient decrease has probably occurred since 1948 and may be related to the decrease in river elevation that occurred during the same interval at the same location.

Channel Morphology

The Red River presently has a high width:depth ratio but information on historic changes of the width and depth are limited. A report of a 1691 expedition (Appendix IV, and Chapter 5) along the Red River in Bowie County, Texas (adjacent to Little River County, Arkansas) indicates that the depth along the main channel, while in its regular bed, was 3.2 to 4.2 m in late November (Hatcher 1932:33-35). This is less than the 6.6 m mean maximum depth of the Red River along the Bowie and Little River County line (U.S. Army Corps of Engineers 1968-1969). The shallower depths in 1691 may be the result of a failure to measure the maximum depth of the channel or to a lesser discharge than that in the twentieth century. However the large

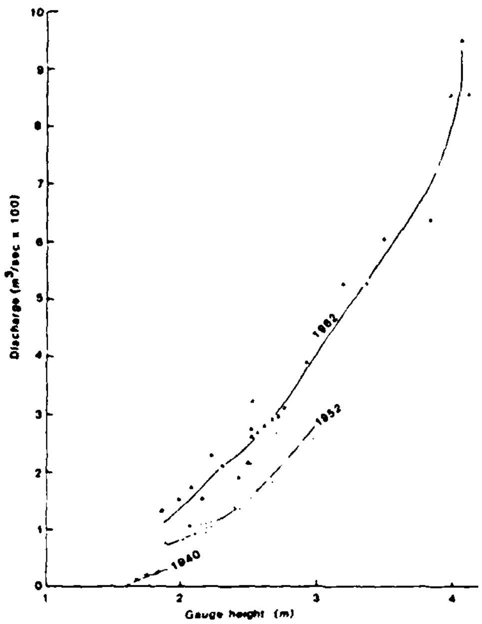

Figure 3-6. The change in river elevation with discharge at Index, Arkansas for 1940, 1952, and 1962. At 300 m^3/sec., the river elevation is 0.37 m higher in 1962 than in 1952.

increase in measured depths (by at least 50%) during the last three centuries suggests that the mean maximum depth may have actually increased with time.

Long term changes of river width are also not well documented. The Red River has decreased in mean width at meander bends by approximately 100 m since 1945. The difference between the maximum and minimum width has decreased by 145 m with time. Maps prior to 1945 are not accurate enough to provide reliable width data. Though the mean width had decreased through time, the change in width of individual meanders is quite variable and not synchronous with that of the regional study area.

Channel Pattern

Most of the Red River, including the section in Arkansas, displays a meandering pattern. The upper reaches (Jacobs 1981:3) and the lower reach below Shreveport (Abington 1973:32) have a tendency to braid. In northern Louisiana the channel pattern was anastamosing where filled with the debris of the Great Raft (Chapter 6). Since the final clearing of this debris in 1873, the river has reverted to its meandering pattern. The meander belt, only 6 km wide at the most, is cut into a 8.5 km wide floodplain that is flanked by Quaternary terraces.

Historic channel pattern changes are the most readily available of all the parameters examined in this study. Maps since 1865 indicate that the mean sinuosity of the Red River in Arkansas was stable prior to 1921 (Figure 3-9). The sinuosity decreased between 1921 and 1945 and has remained relatively low since that time. Similar results have been reported downstream by Abington (1973:48, 50) and upstream by Jacobs (1981:53). The mean wave length and wave amplitude are inversely related to the sinuosity.

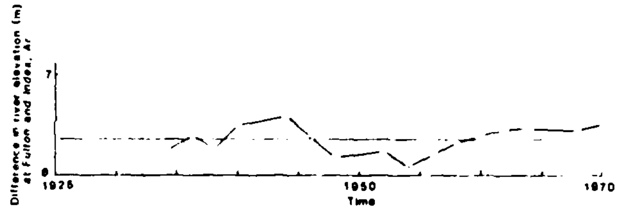

Figure 3-7. Difference in mean January stage height of the Red River at Index and Fulton, Arkansas. Each point is a mean of the five previous years. Horizontal line is the mean, 6.3 m, of the years 1926-1970.

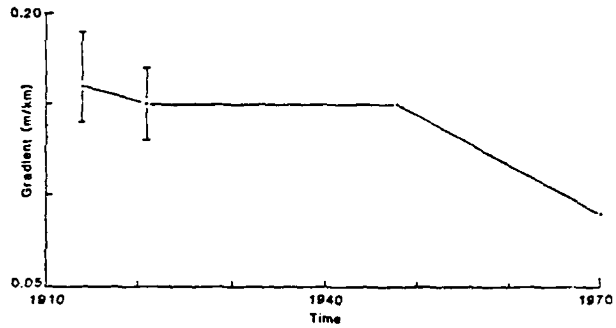

Figure 3-8. The gradient of the Red River between Index and Fulton, Arkansas. The gradient in 1914 and 1921 is estimated using the mean difference in river elevation, 1926-1970 (Figure 3-7). The bars are the ranges of gradient using the maximum and minimum difference in river elevation.

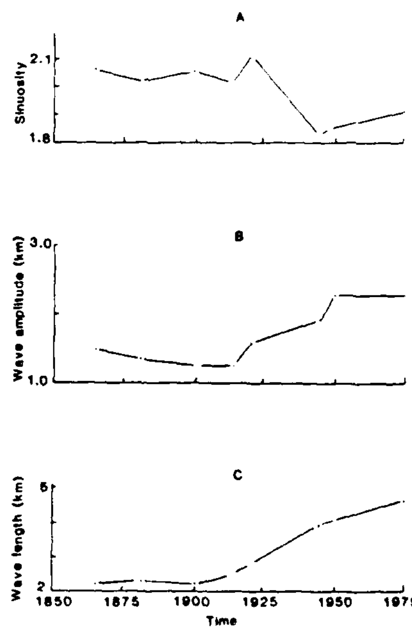

Figure 3-9. Mean sinuosity (A), wave amplitude (B), and wave length (C) of Red River in Arkansas

However, temporal changes along shorter segments of the river are not synchronous with changes along the entire length of the river in Arkansas. Some segments have increased in sinuosity, other segments have decreased in sinuosity, and still others have remained approximately the same (Figure 3-10). In 1719 La Harpe (Smith 1959:249) reported that the sinuosity of the Red River immediately downstream from its confluence with the Bear (Sulphur) River was about 1.6, which is similar to the 1.63 sinuosity measured on the 1975 map. Abington (1973:3) did not report such variability along shorter river segments.

Sediment Transportation and Deposition

The quality and quantity of sediment load that the Red River transports in Arkansas was estimated using data from Louisiana (U.S. Army Corps of Engineers 1980). Particulate matter is transported both as bed load and suspended load. The bed load near Shreveport, Louisiana is dominantly (90%) medium and fine sand. This bed load becomes finer downstream from Shreveport and therefore is presumably somewhat coarser in Arkansas, which is at least 50 km upstream. However, the majority (approximately 87%) of the material transported by the Red River is suspended. The annual suspended load at Alexandria, Louisiana is 3.7 million tons, of which 90% is silt and clay.

Most Holocene deposits of the Red River at the Cedar Grove and Sentell sites are finer grained than the bed load and point bar deposits downstream in Louisiana (Table 3-3; U.S. Army Corps of Engineers 1980; Harms et al. 1963). In Arkansas sand is less abundant than in Louisiana and the most common fraction is very fine instead of medium and fine sand. The finer grain sizes of the sediments sampled in Arkansas are probably the result of the environments that are preserved and sampled in the study area. These environments are interpreted to be of three general types: crevasse splay, point bar, and swale fill, rather than the channel and point bar environments sampled in Louisiana. The 1927 crevasse deposit at the Sentell site is the coarsest deposit examined and is comparable in grain size to the bed load and point bar deposits in Louisiana. Strata along the crest of a ridge, buried by the 1927 crevasse splay, were probably deposited on a point bar prior to 1650. The nearly horizontal strata have uniform textures which are finer grained than the bed load and deposits in Louisiana. The finer grain size may be due to an upper point bar environment or to infiltration of finer material into the

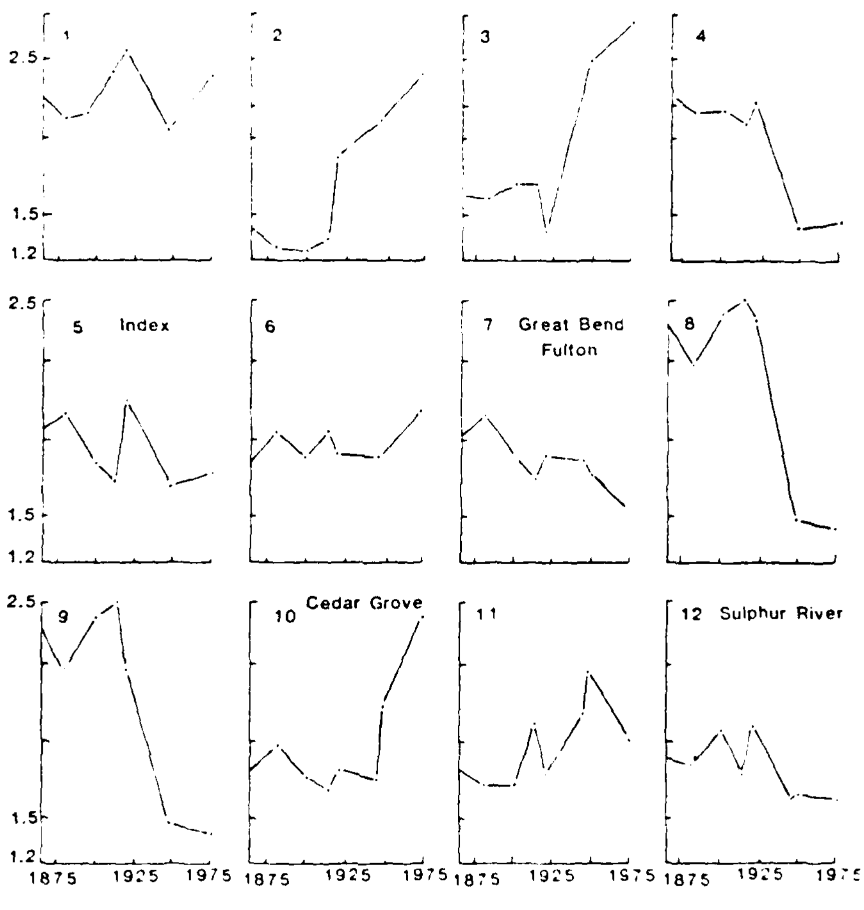

Figure 3-10. Sinuosity of the Red River along 12 segments of the river, 21

Table 3-3. Grain size analyses of Red River deposits

	Environment			
	Crevasse Splay[1]	Point Bar[2]	Swale[1,2]	Point Bar[3]
Sand (%)				
Range	87	55	20-88	27-100
Mean	87	55	62	85
Silt (%)				
Range	9	35-37	9-62	0-66
Mean	9	36	24	14
Clay (%)				
Range	4	8-10	7-33	0-7
Mean	4	9	14	1
No. of samples	1	4	20	5

[1]Sentell site, Arkansas (Kaczor; Appendix II)
[2]Cedar Grove site, Arkansas (Kaczor; Appendix II)
[3]Modern point bar, Shreveport, LA (data from Harms et al. 1963). Four samples are sands and one is dominantly silt.

pores during subsequent floods. Ratios of the coarsest size fractions, least likely to be infiltrated (Figure 3-11), suggest that textural variations are the result of original depositional differences at least in part and therefore may be upper point bar deposits. Off the crest of the ridge the deposits are both older and younger than 1650. The strata slope at a lower angle than the ground surface that they bury and thicken toward the swale. Thus the relief of the ridge and swale topography was diminishing through time and was buried completely by the 1927 crevasse splay. The texture of these slope deposits is much more variable than that on the ridge crest and may be the result of different flood events with varying competencies that trapped muddy slack water in the swales.

The excavations were not deep enough or geographically widespread enough to demonstrate any textural changes solely due to time.

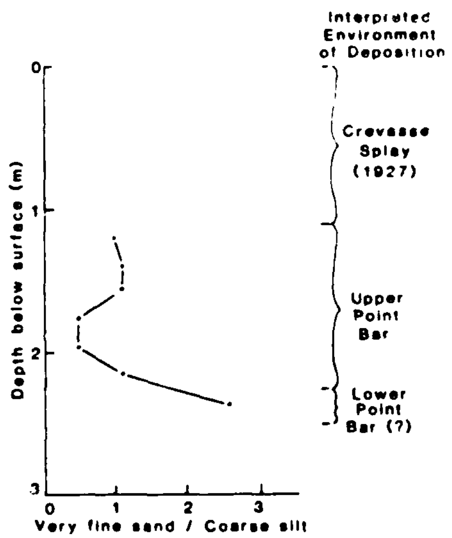

Figure 3-11. Ratio of very fine sand (0.05-0.1 mm) and coarse silt (0.02-0.05 mm) in strata exposed along North-South Trench 2, which is parallel to the levee and along a ridge crest.

CAUSES OF VARIATIONS IN THE RED RIVER

In the previous sections of this report lateral and temporal variations of the Red River have been examined. This section discusses possible causes of these variations. Independent and external variables that may be responsible for changes in the river include time, relief caused by tectonics or isostacy, climate, and man. Dependent variables are those that are intrinsic to the fluvial system. They may be complex and cause abrupt modifications of the system. (Schumm 1977).

Time

The period of time examined in this study, three centuries (10^2 years), is too short to cause appreciable variations in a fluvial system that may develop through 10^{6-7} years. Short term variations about a mean do occur during graded time (10^{2-3} years) (Schumm 1977:2-15) and are probably some of the variations observed in this study.

Relief

Southwestern Arkansas is not a tectonically active area. Seismic events are rare. Precise leveling of the region shows less than 1 mm/year of vertical movement within the study area and 1-5 mm/year of uplift south of Arkansas (U.S. Department of Commerce 1972). Therefore, relief caused by tectonic or isostatic movements is unlikely to be a factor.

Climate and Vegetation

Climatic changes, which may alter drainage, groundwater, vegetation, weathering, and sediment yield, can affect the fluvial system. Lateral variations of precipitation along the Red River are greater than those of temperature. The Red River heads in eastern New Mexico which has a semi-arid climate of 457 mm mean annual precipitation. The climate becomes warmer downstream and the mean annual precipitation in the area is 1270 mm. The climate becomes more humid downstream and the mean annual temperature varies from 13.9 degrees C at Tucumcari, New Mexico to 17.8 degrees C at Texarkana, Arkansas. Within Arkansas the variations are much less.

The precipitation history of the southern Great Plains along the Red River has been reconstructed using tree ring data (Stockton and Meko in press). In Oklahoma precipitation has a periodicity of 17 years since A.D. 1700, but there has been no long term trend toward more humid or arid conditions within that time span. This suggests that the mean annual discharge of the Red River, which flows through the areas, also has had no long term changes in the last three centuries. The historic hydrologic data cited above supports this conclusion.

Presettlement vegetation along the Red River was dominated by forests on the uplands and intermixed forests and prairies along the floodplain and terraces. On the uplands oak, hickory, and walnut species dominated mixed with some short leaf pine and cedar (Bruner 1931; Smith 1959:250; Watkins, Chapter 6, King, Chapter 4). The floodplain was locally a series of cane breaks interrupted by prairies with a variety of grasses. These grasslands were mixed with forests containing oak, hickory, cedar, gum, ash, elm, sycamore, hackberry, locust, willow, cypress, cottonwood, and pecan.

The present vegetation is similar in kind but not in quantity to the presettlement vegetation. The land has been cleared for agricultural purposes. The possible effects of these vegetation changes are discussed in the following section.

Man

The last external variable that may affect a river is the influence of man. The major events that may be responsible for changes in the Red River will be discussed chronologically.

The effects of clearing the forests and plowing the prairies on a fluvial system are difficult to assess. Maps prior to the 1850s may not be accurate enough to quantify the channel patterns. The southern portion of the study area near the Arkansas and Louisiana state line is probably the most accurately mapped and therefore the portion considered. The southernmost study segment (12) of the Red River increases in sinuosity between 1822 and 1914 and the sinuosity of the segment immediately to the north (segment 11) is erratic within the same time period (Figure 3-10). If abundant tree and grass roots adjacent to the channel walls stabilized the banks, it is expected that the meanders would be sinuous (McGowan and Garner 1970; Nadler and Schumm 1981). Clearing this vegetation would probably reduce the cohesiveness of the soil and allow slumping of the banks, decreasing the sinuosity. Thus the increased and erratic sinuosity during the midnineteenth century is the opposite of what is expected. Therefore clearing and plowing the land may not have had a great effect on the channel pattern of the Red River.

The Great Raft was present in 1719 when La Harpe made his way up the Red River (Smith 1959:246-247). He makes numerous references to the difficult travel between Natchitoches, Louisiana and the Bear (Sulphur) River in the southern part of the study area because of the raft. He found the "waters very rapid and many obstructions of timber." The "very difficult log jams" dammed up lakes.

> The passage was difficult because of the forests through which it was necessary for us to cross . . . . We had difficulty in passing because of the very thick trees which are in the water . . . . Then we found some timbers so thick that it seemed incredible to be able to get through them (Smith 1959:247).

The final clearing of the Great Raft in 1873 appears to have had little effect on the river in Arkansas. Though the channel pattern in the southern portion of the study area changed between 1844 and 1882, there is little change in the mean sinuosity and meander wave length (Figures 3-9, 3-10, segment 12). However the wave amplitude decreased significantly during these four decades.

The levee system, completed at the end of the nineteenth century, also seems to have had little effect on the Red River channel. By 1914 the mean sinuosity and mean wave length was slightly less than that during the previous five decades and the mean amplitude was only slightly lower (Figure 3-9).

The closing of Denison Dam in 1934 seems to have had little direct effect on the river in Arkansas. Leopold et al. (1964:455-458) report downcutting of the river bed 25 km downstream from the dam, but this is far short of the 300 km distance between the dam and the study area. The dam closing occurred after the major channel pattern changes began (1914) in the study area. The only effect that is evident in Arkansas is a decrease in the variability of the discharge, but not the mean discharge (Figure 3-5).

Intrinsic Factors

The major change in the Red River of Arkansas in the past century occurred between 1914 and 1945. During these three decades the mean sinuosity decreased and the wave amplitude and wave length increased throughout the study area (Figure 3-9).

However, along smaller segments of the river the trends of the channel patterns may be different than that of the entire study area (Figure 3-10). Two patterns of channel sinuosity variations with time are present. In the first type of pattern the change in sinuosity is abrupt, the difference in sinuosities is great (1.2-1.5) and the sinuosities are extreme (1.2-1.7 and 2.4-2.9). These variations appear to be cyclic, but the cycles are longer than the 110 years of record, perhaps two to three times as long. It is interesting to note that the low sinuosity segments of the stream may abruptly increase their sinuosity (segments 2, 3, and 10, Figure 3-10) and high sinuosity segments of the stream may abruptly decrease their sinuosity (segments 4, 8, and 9, Figure 3-10). These unstable segments are adjacent to one another. The abrupt sinuosity variations are probably the result of the river crossing a threshold. This causes the river segment to become unstable and it must rapidly compensate for the instability by changing its sinuosity.

In the second pattern of channel sinuosity variations with time (segments 1, 5, 6, 7, 11, and 12, Figure 3-10) the change in sinuosity is also abrupt and may be significant, but the difference in sinuosity is less (0.1-0.7) than, the sinuosities are intermediate (1.6-2.5) to, and the time span is shorter (20-65 years) than that of the first pattern type. These segments may be relatively stable, merely fluctuating about a mean. If the sinuosity approaches either extreme, the river may become unstable and change to the first pattern type.

CONCLUSIONS

To conclude, external variables since the midnineteenth century do not seem to correspond to changes in the channel pattern or morphology. Changes in channel pattern may lag behind the cause for that change. If so, it would be expected that all the segments of the river would show a similar response and that this response would be synchronous or sequential, either up or down the river. The abrupt changes in channel pattern between 1914 and 1945 are approximately synchronous, however, they do not show the same response. Therefore it would seem unlikely that the changes in channel pattern were caused by but rather have lagged behind the introduction of an external variable such as levee construction or clearing of the Great Raft.

Instead the channel pattern changes seem to be the result of intrinsic variables of the river itself and these variables are quite complex (Schumm 1977). Along local segments the river has relatively small variations in sinuosity over a short time span, if the sinuosity is intermediate. These segments are probably stable. Local segments of the river with extremely low or extremely high sinuosities are probably unstable and abruptly change their sinuosity to the other extreme. These abrupt changes in sinuosity have occurred only once in the last 110 years and are most common between 1914 and 1945.

Based on these conclusions, some speculation about river behavior can be made for two centuries previous to the period of study. The data from the most recent century can be used for these predictions because it is unlikely that man has had a significant influence on the hydrology, sedimentation, erosion, or channel pattern, and morphology of the Red River.

Sinuosity changes of the Red River appear to be cyclic, both on a local scale and on a regional scale, though no segment of the river has undergone a complete cycle since 1865. Many segments of the Red River can be used to construct an idealized sinuosity cycle (Figure 3-12). High sinuosity along a local stretch of the river can continue at least 55 years and probably more than 110 years. During this period of high sinuosity there are variations as a single meander is cut off, but contin[illegible] development of other meanders within the segment caus[illegible] the sinuosity to increase again. Eventually the river may become unstable and most meanders will be cut off causing the sinuosity to decrease rapidly (25-35 years). Relatively low sinuositites may prevail for at least 80 years and perhaps more than 110 years before the sinuosity abruptly increases. This increase may occur in 30-65 years. Therefore, the length of the entire cycle is probably at least twice as long as the 110 years of

Figure 3-12. **Idealized sinuosity cycle of the Red River, Arkansas. The time scale is hypothetical.**

record. The reports of La Harpe (Smith 1959) suggest that a 300 year cycle is reasonable.

The regional variations of the Red River are similar to local segments of the river, but the high and low sinuosities are not as extreme, the variations are less than that of the segments, and the variations of local segments and the regional area are nonsynchronous. The relatively high sinuosities dominated for more than 55 years. After 1921 the sinuosity decreased to relatively low values within 25 years and has remained low for more than 30 years. Presumably the sinuosity will increase again and patterns along the local segments suggest that it may increase rapidly.

CEDAR GROVE AND SENTELL SITES

The Cedar Grove and Sentell sites were occupied by the Caddo Indians between 1650 and 1750. The location and activity of the river during that time are of interest in order to evaluate the site and the use that the Indians made of the site. The location of the river prior to 1827 can be estimated using aerial photograhs and dating surfaces using artifacts.

The Cedar Grove and Sentell sites are located within segment 10 of this study. This stretch of the river had a relatively low sinuosity prior to 1945. Since that time the sinuosity has abruptly increased and is presently approaching the maximum sinuosity present within the study area. Prior to 1865 the sinuosity was probably relatively low for some unknown length of time, perhaps 110 years if the proposed cycle (Figure 3-12) is valid. Sometime prior to 1835 the sinuosity may have been much higher, perhaps similar to that of today.

Lester Bend is present on the 1827 map (Figure 3-13). Though details of the meander have changed since 1827, the general outline of the meander was similar for 118 years. This stability has allowed preservation of the Cedar Grove and Sentell sites. Since 1945 the sinuosity of the river has increased, the northern limb of the meander has migrated south, and the sites were in danger of being eroded until revetment construction halted the migration.

If the Caddo Indians established the Cedar Grove site on a point bar immediately adjacent to the Red river between 1650 and 1750, some estimates of meander migration rates can be made. However, if the site was at some distance from the river bank, such as on an upper point bar deposit as suggested by the textural analyses (Table 3-3; Figure 3-11) and the thickening of the strata into the swale, the rates would be less than those estimated. Artifacts within these swale fill deposits do indicate that the site existed sometime after the river migrated from this location and that the area was only subjected to periodic flooding and colluvial processes. Thus, slower rates of meander migration than those estimated below are probable. The meander has migrated 1500 m west of its position between 1650 and 1930 (5.4 m/year). Most of the migration occurred before 1827 (Figure 3-13) and therefore the migration rate may be between 5.4 and 8.5 m/year. Between 1930 and 1976 the river migrated another 450 m west. Thus the rate of migration, 9.8 m/year, probably increased during the period of time that the sinuosity increased.

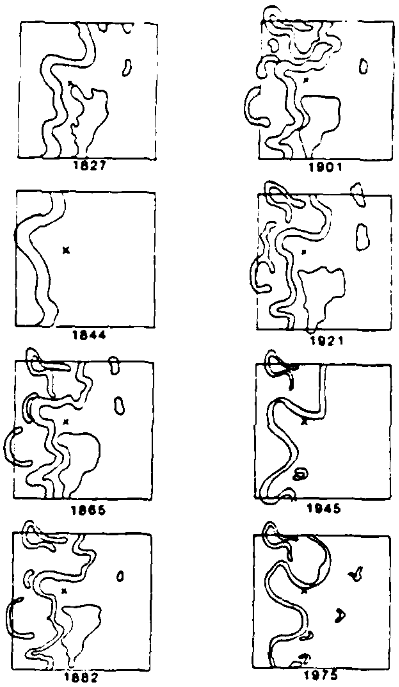

Figure 3-13. **Historic Red River channel patterns in T17S, R25W, Miller and Lafayette counties, Arkansas. Dot is the Cedar Grove site.**

In conclusion, the Cedar Grove and Sentell sites were located along high ridges within an area of ridge and swale topography. The sites were probably some distance from the channel at the time that they were occupied. They were preserved from fluvial erosion for 300 years because of the stability of Lester Bend. Recent increases in sinuosity and meander migration threatened erosion of these sites, but further erosion should be minimal because of revetment construction.

Location of other sites may be more favorable along meanders similar to Lester Bend. Though occupation sites may have been located along many meanders of the Red River, site preservation is more likely along stable segments of the river. Reconnaissance for additional sites in such meanders should be done to test this hypothesis.

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Chapter 4

PRESETTLEMENT VEGETATION OF THE CEDAR GROVE SITE

Frances B. King

Reconstruction of the environments in which aboriginal groups lived is an important initial step in studies of human subsistence and settlement. Regardless of cultural influences, the physical and biotic resources of an area are important in determining settlement patterns and loci, seasons of occupation and the specific plants and animals exploited at a given site.

One of the best methods of reconstructing the vegetation of an area is by analyzing survey records produced by the General Land Office. These records are the notes of the GLO surveyors who laid out the system of townships, section and range lines which are the basis of land ownership. The surveys were made in the early 1800s, at the time that major Euroamerican settlement was taking place. Despite the fact that there were sometimes bias or fraud in the surveys, and that factors such as climatic change and fire make it impossible to confidently extend the records far back in time, the GLO records remain one of the only methods of vegetational reconstruction (King 1978, Wood 1976, Bourdo 1956). For the late protohistoric period under consideration here, the data are exceptionally useful.

As the surveyors laid out the townships, they blazed two or four witness trees at each section and quarter section corner. In the process, they recorded the taxa, diameter, distance, and bearing of each tree. They also noted soil and forest quality, suitability of cultivation, prairies, lakes and streams, old fire scars, existing habitations and improves, and other features of the early American landscape.

Because of the value of the data contained in the GLO survey records, many methods have evolved to reconstruct forest structure and composition data including the types and relative abundance of various trees, the relative dominance (based on basal area), and the number of trees per acre (Cottam and Curtis 1949, 1955, 1956; Cottam et al. 1953; Howell and Kucera 1956).

The Cedar Grove site lies in Township 17 South, Range 25 West of the 9th Principal Meridian, in Lafayette County Arkansas. The Red River meanders through the township forming a natural obstacle to travel and to surveys. Therefore, the portion of the township east of the Red River was surveyed between July and November of 1822 by S. W. Miley while the portion west of the river was surveyed in January of 1842 by C. E. Moore.

PHYSIOGRAPHY

Lafayette County lies on the Gulf Coastal Plain, the "gulf slope" of Braun (1950). The county lies almost entirely in the broad and nearly level floodplain of the Red River. The soils are the result of relatively recent alluviation by the flood waters of the river and consist primarily of water washed material, mostly sands and silts (Table 4-1). The floodplain is characterized by numerous oxbow lakes and poor natural drainage because of the lack of topographic relief and heavy soils.

Table 4-1. Characteristics of various soil types in the Cedar Grove area (Soil Conservation Service 1980)

Soil and % of Association	Drainage	Slope	Parent Material
Severn 40	well	level to gently	fine sandy
Oklared 30	well	undulating	loam
Billyhaw 40	somewhat poorly	level to nearly	clay
Perry 30	poorly	level	clay
Caspiana 55	well	level and	silt loam
Rilla 30	well	undulating	silt loam
Wrightsville 40	poorly	level to nearly	silt clay
Mayhew 35	poorly	level	silt clay

The soils adjacent to the river belong to the Severn-Oklared association (Soil Conservation Service 1980) are deep, well drained because of the high sand content, and level to gently undulating. In close proximity but farther from the river are the Billyhaw-Perry soils. These formed from clayey slackwater deposits and have poor internal drainage. They have a seasonally high water table during the late winter and early spring and evidence of overflow was frequently mentioned by the GLO surveyors when describing areas with this soil type.

A small portion of Lafayette County, including part of the township in which the Cedar Grove site lies, is covered by Caspiana-Rilla soils. These are deep, well drained, moderately permeable, level soils that have developed from loamy alluvial deposits on the Red River floodplain (Soil Conservation Service 1980).

Another portion of the area is covered by soils of the Wrightsville-Mayhew group. These soils are deep, level, and poorly drained. They formed from silts on the broad, upland flats of the Coastal Plain (Soil Conservation Service 1980). These soils are low in natural fertility and organic matter. Because of the high clay content, they have a high seasonal water table during the winter and spring. These soils only extend into the extreme eastern portions of sections 24, 25, and 36 and are disregarded in further discussions of the soils of the Cedar Grove area.

Meanderings of the Red River

The township is dominated by the wanderings of the Red River over its floodplain which covers approximately two-thirds of the township. Numerous oxbow lakes and ponds attest to past movements of the river (see Chapter 3). Even between the 1822 and 1842 surveys, the Red River appears to have moved considerably (Figure 3-13). These migrations of the river have kept portions of the floodplain vegetation in a continual state of plant succession at all times. The "pioneer" woody plants of the river banks include willows which are very tolerant of flooding and act

Table 4-2. Forest structure and composition for T17S R25W based on GLO witness tree data

Specis Name	Scientific Name	Average Diameter	Relative Abundance	Relative Dominance	Trees/Acre
Ash	Fraxinus sp.	11.7	15.0	13.1	14.3
"Black oak"	Quercus phellos	18.0	10.7	14.3	10.2
Boxelder	Acer negundo	9.3	6.4	4.4	6.1
Cottonwood	Populus deltoides	39.9	0.7	2.1	0.7
Cypress	Taxodium distichum	9.9	0.7	0.5	0.7
Elm	Ulmus sp.	10.8	14.3	11.5	13.7
Hackberry	Celtis laevigata	10.8	10.0	8.2	9.6
Hickory	Carya sp.	10.7	3.6	2.9	3.4
Honey locust	Gleditsia triacanthos	9.9	0.7	0.5	0.7
Mulberry	Morus rubra	8.2	2.9	2.7	2.7
Overcup oak	Quercus lyrata	13.4	1.4	1.4	1.4
Persimmon	Diospyros virginiana	14.9	0.7	0.8	0.7
Pine	Pinus sp.	13.9	0.7	0.7	0.7
Pin oak	Quercus palustris	11.9	0.7	0.6	0.7
Red oak	Quercus falcata	15.9	0.7	0.8	0.7
Sassafras	Sassafras albidum	11.3	2.1	1.8	2.0
Sweet gum	Liquidambar styraciflua	17.1	11.4	14.5	10.9
Sycamore	Platanus occidentalis	10.2	2.9	2.2	2.7
"White oak"	Quercus lyrata	16.7	14.3	17.8	13.7

to stabilize the new alluvial deposits. When enough alluvium has accumulated, cottonwood becomes established, followed in time by more mesic species. The continual movement of the river channel means that new areas are continually being colonized by species such as willow. Other areas which have been abandoned by the river for a long period have a plant community in a relatively late stage of succession.

RESULTS

A total of 19 tree taxa were used by the surveyors as line trees in the township which includes the Cedar Grove site. The common and scientific names of these trees are listed in Table 4-2 and this table and Table 4-3 have data on the average diameter, the relative abundance (calculated by dividing the number of recorded trees of any one species by the total), the relative dominance (calculated by dividing the total basal area for each species by the basal area for all species) and the average number of trees each type per acre, based on the distances and bearings to the witness trees.

Table 4-3. Relative abundance of the ten most common trees on various types and the riparian community, based on General Land Office survey witness trees data (Range 17 South, Township 25 West)

Taxa	Severn Oklared	Billyhaw Perry 1 *	Caspiana Rilla	Billyhaw Perry 2 *	Riparian
Ash	15.7	25.8	7.1	7.8	11.1
Black oak	7.1'	16.1	35.7		
Boxelder	12.9				
Cottonwood	1.5				37.5
Elm	17.1	19.4	14.3		8.3
Hackberry	8.6	25.8			2.8
Hickory	4.3	3.2	7.1		
Mulberry	5.7				
Sweet gum	17.1	3.2	21.4		13.9
Sycamore	5.7				12.5
White oak	5.7	6.5	14.3	92.3	
Number of Trees	70	31	14	13	72

*Billyhaw Perry 1 is better drained than Billyhaw Perry 2

The southeastern portion of the township is covered by clayey slackwater deposits belonging to the Billyhaw-Perry soil association. These soils are characterized by a seasonally high water during late winter and early spring. A portion of this area was subjected to frequent flooding, based on the GLO line descriptions, the remainder apparently generally escaped inundation. The vegetation of the frequently flooded portion was described as "second rate", and mentions pine, oak, gum, ash, hickory, sweet gum, elm, hackberry, and honey locust. The undergrowth was composed of seedlings and small trees of the same with vines and briars in addition.

The tree used as witness trees in this relatively wet area include 7.8% ash and 92.3% "white oak." Unfortunately, the name "white oak" normally refers to Quercus alba which is a mesic, upland species and entirely out of place in this situation. Rather, one would expect Q. lyrata (overcup oak), Q. nuttallii (Nuttall oak), Q. nigra (water oak), or Q. phellos (willow oak), all of which are common in wet floodplain forests of the Coastal Plain. However, one of the less common synonyms for overcup oak is "white oak" (Fowells 1965:600) and it is assumed that the surveyor knew the tree by that name. The Overcup Oak-Water Hickory type of bottomland forest, of which this area is probably representative, occurs extensively in low, poorly drained sites, especially back water areas. It is characteristic of areas that are flooded 29-40% of the time (Moore 1950:8, Arkansas Department of Planning 1974:24).

The remainder of the area covered by Billyhaw-Perry soils is also poorly drained to somewhat poorly drained although the GLO line descriptions do not mention evidence of flooding. The dominant trees mentioned by the surveys are ash (25.8%), hackberry (25.8%), elm (19.4%), and black oak (16.1%). Black oak, like white oak, is a mesic, upland species, out of place in such abundance in the floodplain forest of the Red River. However, "black oak" is also a synonym for willow oak, which would be expected in this situation, and it is assumed that this is the species that was meant by the surveyor. If that is the case, this area probably represents the willow oak stage of bottomland forest succession (Moore 1950:8). This forest type occurs on flat, poorly drained soils and on low clay ridge sites in the floodplain.

Many of the same tree taxa are listed in the line descriptions for the better drained portions of the township covered by Severn-Oklared soils (Table 4-3). The forest in this area was described as "rich", the land "first rate" and "fit for cultivation." The soils are level, somewhat sandy and well drained. Overcup oak (white oak) is much less common, and elm, ash, and sweetgum are the dominant taxa. Numerous other trees were also recorded including cottonwood, boxelder, mulberry, pin oak, red oak, sassafras, and hickory. The understory was described as consisting of seedlings and young trees of the same species, with the addition of cane and vines. These trees probably represent the sweetgum forest type (Moore 1950:8; Arkansas Department of Planning 1974:24). This type of forest is found on sites with shorter periods of submergence (10-21%). Being more mesic, this forest is also more diverse than the overcup oak-water hickory type.

The small area of Caspiana-Rilla soils in the northeastern portion of the township is dominated by "black oak" which has already been translated as willow oak. Caspiana-Rilla soils are better drained and the relatively large amounts of sweetgum and ash suggest that this area is intermediate between the sweet-gum dominated forest type found on the higher, better drained soils and the willow-oak type found on low clay ridges. Most likely, the area is a mosaic of the two types of sites rather than being uniformly intermediate and the GLO survey recorded trees growing on both types. Within this area lies a small prairie (Figure 4-1) which was probably once dominated by Andropogon gerardi (big bluestem), Sorghastrum nutans (Indiangrass), Panicum virgatum (switchgrass) and Schizachyrium scoparium (little bluestem) (Arkansas Department of Planning 1974).

Within the township are more poorly drained sites. The wettest of these are described as "low and swampy", with not only ash, oak, and elm, but also willow, cypress, and cottonwood. The undergrowth was described as "cane and vines." Bald cypress is indicative of the wettest sites since it grows only where water stands most, if not all of the year.

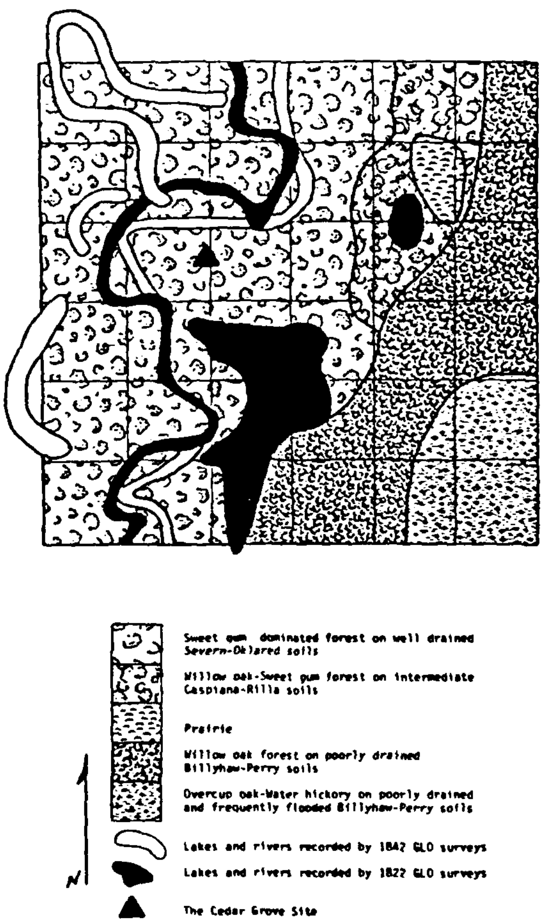

Figure 4-1. Presettlement vegetation of T17S, R25W, Lafayette Co., Arkansas, based on original General Land Office survey records.

The GLO surveys ran along the margins of the Red River and the many floodplain lakes, establishing witness tree points wherever a section line intersected the water body. Based on this witness tree data (Table 4-3), the river banks and lake margins were dominated by cottonwood (37.5%) with large amounts of sweet gum, sycamore, and ash.

PLANT RESOURCES

As discussed above, the Cedar Grove site lies near the Red River, completely surrounded by diverse bottomland forest. Within a short distance there are currently, and undoubtedly would have been in the past, riverine resources as well as those presented by the oxbow lakes, bald cypress swamps, and, at a slightly greater distance, prairie.

The plant resources available to the inhabitants of the Cedar Grove site would have been numerous, although somewhat different than those available on the uplands. Most important, the nut producing oaks and hickories are much less common in the floodplain. Instead, the common species are those which do not produce edible parts. These include ash, cottonwood, cypress, elm, sweetgum, and sycamore. In addition, many of the nut producing species that do occur, such as willow or water oak and water hickory have nuts that are small and bitter compared to some upland species. Frequently too, bottomland trees reach enormous size because of plentiful water and nutrients. It is more difficult to collect fruit or nuts from large trees than it is from small ones even if the production is great.

Important plant resources that would be available within the vicinity of the Cedar Grove site would still include some nuts and acorns, especially Carya illinoensis (pecan) and C. ovata (shagbark hickory). Persimmon (Diospyros virginiana) would occur on the better drained sites as would hackberry and Morus rubra (mulberry). Hawthorns (Crataegus sp.) and paw paw (Asimina triloba) might be locally common.

Smaller woody plants which produce edible parts would include Rubus sp. (blackberries and raspberries), Vitis sp. (grapes), Corylus americana (hazelnut) and Sambucus canadensis (elderberry). Other plants known to have been utilized by the Caddo include Apios americana (groundnut), Prunus sp. (wild plums and berries), Nelumbo lutea (American lotus), and Fragaria sp. (wild strawberries).

The Cedar Grove site lies near the Red River on an area of relatively good, easily worked soil. The site could probably only have been occupied for a portion of the year because of flooding during the late winter and spring. While nut exploitation and processing might have taken place at the site, it would probably have been more efficiently undertaken in the uplands or on higher terraces.

Because of the known Caddo emphasis on plant cultivation, it is most likely that the site was placed to make maximum use of the ease of transportation afforded by the river and of the friable soil, and that wild plants were of secondary importance.

Although all were not found at the Cedar Grove site (see Chapter 14), the Caddo are known to have cultivated corn, beans, pumpkins, sunflowers, and tobacco (Swanton 1946:292). Bioarcheological evidence (Rose, Chapter 16) suggests that maize cultivation was not as important at the Cedar Grove site as it was at the earlier Caddo sites or as it was at upland sites. However, the presence of maize, bottle gourd, and pepo squash indicates that at least some plant cultivation was being undertaken in addition to the use of nuts, lotus, wild fruits, and of course, animal resources.

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Chapter 5

EUROPEAN CONTACT AND THE CEDAR GROVE SITE

Neal L. Trubowitz

IDENTIFYING EUROPEAN CONTACT

In the past archeologists have generally assumed, in thought if not in print, that European trade goods, notably glass beads and metal tools or fragments (axes, gun parts), would be found on sites of the contact era. This belief implies several underlying assumptions. It assumes a constant rate of contact across the entire region, that Indians had equal access to such materials, and that trade goods were preponderantly made of materials which will survive in the archeological record in a form recoverable by current archeological techniques. Such expectations are unrealistic. Ethnohistoric records available on the Caddoan area from 1650 to 1750 indicate that none of these assumptions can be supported; the rate and amount of contact varied within the Caddoan region, early documents clearly describe ranked societies where there was unequal access to various resources, and European trade goods often were made of materials (cloth, ribbons) which, given the climate of the region, are unlikely to survive except in rare accidents of preservation. If present they are not in a form recognizable to and recovered by the standard excavation techniques utilized by researchers today.

Those working most closely with the Caddoan archeological record have noted the fallacy of simple equations of European artifacts with the contact period. As more data have become available it has been determined that few European items are present even on those sites where they are found:

> It may be well to point out here the striking scarcity of European objects in historic and Caddoan sites when we consider how many Indians and whites were involved over a period of two centuries or more. In any one site, something like twenty beads and two bits of iron may be all that can be found to represent perhaps a century of contact; and this being true, there must be scores of sites actually occupied during the same "historic period" from which the archeologist cannot recover a single European object (Krieger in Davis 1961:129).

Past reconstructions of Caddoan lifeways (Bolton 1908; Hatcher 1927; Swanton 1942; Griffith 1954) have synthesized a synchronic ethnographic account from a fragmentary set of diachronic records. These have been applied to the archeological record under the assumption that there were *cultural continuities* between late prehistoric and postcontact tribal histories. Perttula and Ramenofsky (1980:2) advise caution in directly correlating archeological and ethnographic units. Nevertheless, the contact era has generally been treated as a single entity, oversimplifying a complex process that may vary over time and space. What is needed is "a processual consideration of the contact period, i.e. a focus on change" (Perttula and Ramenofsky 1980:3). Perttula and Ramenofsky proposed a model of Caddoan cultural change for the entire Caddoan area during the historic period that takes into account the diachronic nature of the archeological record. Their model is useful, and must be applied in detail within each subarea of the Caddoan region because of their variable histories (Perttula 1980:6). It is the goal of this chapter to present a contact era model for the Arkansas Great Bend subarea.

Perttula and Ramenofsky (1980) have argued for a threefold view of the contact era in the Caddoan area:

> From an aboriginal perspective European contact involves two variables: people and products. Simply, contact may take three forms; (a) products without people (Dobyns 1963), (b) people without products, and (c) people with products. The latter form is usually taken as the starting point, and the effects of the first two forms ignored. There is abundant ethnohistorical evidence (Swanton 1939) that change in demographic profiles and the diffusion of European goods (for instance, see Milner 1980) preceded actual colonizing efforts in the Southeast, thus making even the earliest histories descriptions of systems already changing rather than "pristine" (Perttula and Ramenofsky 1980:4).

Krieger (1946) had recognized that European goods (products) preceded a European entrada (people) among the Caddo of central Texas in 1686.

No agreement has yet been reached on whether European diseases spread beyond the directly contacted Native populations in the Mississippi Valley and Trans-Mississippi South following the De Soto entrada of 1541-1542 (cf. Ramenofsky 1981 and discussions at the 1982 Southeastern Archaeological Conference Meeting in Memphis). This question is also problematic for other European entradas.

However, since the potential for the spread of European diseases among the Indians occurs as soon as the first face-to-face contact is made, it is suggested that there really is no category of "people without products" as outlined by Perttula and Ramenofsky. Europeans bereft of any of their technological accoutrements could still bring contagious diseases to the New World, creating "virgin soil epidemics" among the native populations that had no natural immunological defenses (Crosby 1976:288). For example, Cabeza de Vaca and the other castaway survivors of the Narvaez expedition to Florida, are likely to have been the carriers of the 1528 epidemic among the Gulf Coast Karankawan Indians, and indeed were blamed as the cause by some of the Indians themselves (Ewers 1973). While not beneficial, epidemics were a "product" left with the Indians by Europeans, perhaps the most significant one they received, as it was ultimately the major factor in the severe aboriginal population declines which occurred between 1528 and 1890.

Thus, the use of "contact" in this volume is a modification of the three-variable Perttula and Ramenofsky definition, including only people with products or products without people.

In the following pages I shall attempt to provide an outline of the ethnohistoric records that bear on the Cedar Grove site, as one example of a contact era site, within the Spirit Lake locality of the Great Bend region . The Great Bend region is a part of the general Caddoan area that is documented to have been inhabited by the Kadohadacho Confederacy which Williams (1964) tentatively linked to an archeological counterpart, the Little River phase. As Williams noted, the documentary evidence is clear that the Kadohadacho inhabited this general subarea from the first European direct contact in 1686 until the surviving members moved out between 1790 and 1795. Therefore, we can be confident that despite the diachronic nature of the contact era, in the Great Bend subarea we are dealing with an uninterrupted continuum in terms of tribal sedentarism. Schambach (Chapter 11) has refined the earlier ceramic analysis (Schambach 1981) which led him to separate the Great Bend Region into two subareas, applying the Little River phase to the archeological sites upriver from Cedar Grove, including Rosebrough Lake, Hatchel, Mitchell, and Moores in Bowie County, Texas (Wedel 1978:Figure 3), and defining the Chakanina phase to cover the adjacent Spirit Lake and Boyd Hill archeological localities along the Arkansas portion of the Red River.

The approach taken here is to provide a broad chronological overview of the contact era, starting at the regional level and then focusing on the Spirit Lake locality and the Cedar Grove site in detail. By going from the general to the specific we are probably paralleling the overall process of culture contact as it affected the Cedar Grove site. The chronological narrative is provided as a convenience to assist those less familiar with the numerous historical sources on the Caddoan region, which are often organized on a state by state basis (which can obscure the regional perspective), or from a European/exploratory point of view. The summary will place the discussion following it within the regional context that potentially had an impact (both direct and indirect) on the occupants of the Cedar Grove site between 1670-1730. Figure 5-1 provides a simplified map of the locations of key European establishments referred to in the text.

No claim is made that the documents examined for determining the scope of contacts are exhaustively complete. The background research was restricted to those secondary sources and translations of original manuscripts that were available in the University of Arkansas at Fayetteville and Arkansas Archeological Survey libraries. Even when copies of original manuscripts were available, the translations had to be relied on for lack of time to check their accuracy or retranslate the originals. This leaves the caveat that some of the earlier translations are often incomplete or have inaccuracies. For example, I had to rely on the Ralph A. Smith (1959), translation of the 1718-1719 La Harpe journey up the Red River, which is based upon a printing of the journal by Pierre Margry "wherein Margry made inexcusable alterations, deletions, and additions" (Wedel 1978:2). At minimum, except for the 1718-1719 Alarcon expedition (Hoffman 1935), I was able to obtain at least one translation relating to the major recorded entradas for the general Caddoan area between 1686 and 1767, relying on historians' secondary accounts to summarize earlier European visitations to the margins of the Caddoan region. Therefore, the historical background reflects some accumulated errors resulting from faulty translations as well as a diachronic set of observations. The period selected for study was from 1500-1750, covering the maximum time span before the occupation of Cedar Grove that could have European contact, through the latest possible date for Caddo IV/V component at the site. This time span is broken down into the period preceding occupation of Cedar Grove and the time corresponding to the 100 years surrounding its habitation.

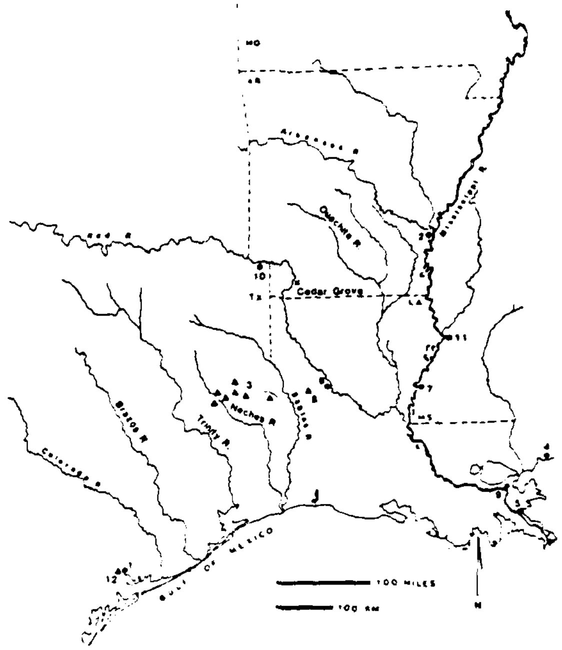

Figure 5-1. European posts surrounding Cedar Grove, 1670-1730. Circles are French; triangles are Spanish. 1. Ft. St. Louis; 2. Arkansas Post; 3. Texas missions; 4. Ft. Maurepas; 5. Ft. of Mississippi; 6. Natchitoches; 7. Ft. Rosalie; 8. Los Adaes; 9. New Orleans; 10. Nassonite post; 11. Yazoo; 12. Espiritu Santo

PRE-CEDAR GROVE: EARLY EUROPEAN EXPLORATION 1500-1650

Within a decade of the discovery of the Western Hemisphere by Columbus, thousands of Spanish settlers began occupying the Caribbean islands, notably Hispanola, followed by Puerto Rico (1508) Jamaica (1509), and Cuba (1511) (Craven 1970). Undocumented shipwrecks began to litter the island fringes and the Gulf Coast shore. Spanish explorations of the mainland at first focused on opposite ends of the Gulf, Florida and Mexico. Ponce de Leon made two limited attempts at exploring and settling Florida in 1513 and 1521, followed by the equally unsuccessful 1528 expedition under Panfilo de Narvaez, with some 400 men and 180 horses. A 1517 slave raid by Hernandez de Cordoba on the Yucatan was the precursor for the conquest of the Aztec empire in Mexico by Cortez, between 1519 and 1522. Thereafter, the Spanish slowly expanded from the Aztec capital northward into what is now northern Mexico, New Mexico, and eventually east Texas.

Formal exploration of the Gulf Coast between Mexico and Florida began in 1519 with the mapping expedition of Alonzo Alvarez de Pineda, but was not resumed for 166 years. However, there were several times in the interim when Spanish expeditions bound elsewhere made landings on the Texas Gulf Coast. Cabeza de Vaca and some 90 survivors of the Narvaez expedition were shipwrecked in 1528 and then began a trek through the interior of Texas and New Mexico before De Vaca and only three others made their way into Mexico in 1536 (Sauer 1971). At the time of their wreck it is unlikely that the Spaniards had much left in the way of material goods; they soon were

clothed and living like the Indians, who had to support the nearly helpless Europeans. In 1554 a Spanish fleet was wrecked by storms on the Texas coast about five days march north of the Rio Grande. The survivors (numbering from 300 persons to only 26 depending on the source consulted; Bolton 1912; Arnold and Weddle 1978:47-48) made their way back to Tampico, then called Panuco (Bolton 1912). An expedition on its way to Pensacola Bay was also blown ashore temporarily in 1558.

In 1539 the missionary Marcos de Ninza reached the Zuni pueblos west of the Caddoan region in New Mexico, while the Hernando de Soto expedition with some 600 persons landed in western Florida and began the overland march to the Mississippi River, reaching it in May, 1541, and crossed the following month into Arkansas, where they may have visited the Parkin site (Morse 1981). Unfortunately, there is little agreement on the route of the De Soto expedition. At present there are no archeological data recorded to verify whether some of the survivors under Luis de Moscoso crossed the Red River somewhere in the Great Bend region as suggested by Pool (1975:21-22), or to the south in Louisiana above Shreveport (Sauer 1971:177, Figure 14). In any case, it appears that members of the De Soto expedition did make the first face-to-face contact with Caddoan Indians in 1542 before returning to Mexico in 1543.

Meanwhile, Francisco Vasquez de Coronado, who had left Mexico in 1540 with an army of some 1000 men, 1500 horses and mules, plus sheep and cattle, was exploring New Mexico and the Texas Panhandle, not returning until 1542 (Pool 1975:20-21). By 1543 the Spanish were operating mines in New Mexico, though the bulk of the exploration of New Mexico was delayed to the period between 1581 and 1611, after settlements in Mexico proper had gradually been extended northward to Monterrey and Monclova (Pool 1975:26). Some of the exploring of Juan de Onate between 1598 and 1601 may also have reached the Canadian River in the Texas Panhandle (Pool 1975:21). The major event in the settlement of New Mexico was the founding of Sante Fe in 1606, which became the primary northern Spanish outpost.

THE CEDAR GROVE ERA: INCREASING CONTACT 1650-1750

After the Onate expedition of 1601, Spanish exploration of New Mexico declined, little in the way of treasure or exploitable resources had been found among the often hostile Indians of the region, and only two more recorded entradas were made in 1629 and 1634 (plus possibly a third in 1662; Bolton 1912). Along the Rio Grande River, missionary activity continued with a number of expeditions crossing into southern Texas between 1628 and 1634 (going as far as the Nueces River; Thomas 1939:938) followed by a lull until missionaries possibly crossed the river in 1650 (Martin and Castillo) and 1654 (Diego de Guadalajara) (Bolton 1912). Five years later the first mission was founded at El Paso, followed by a second there in 1680. Two more brief missionary trips across the Rio Grande were made in 1674 by Father Larios and in 1675 by Lieutenant Fernando del Bosque (Steck 1932). Neither of these expeditions involved over 30 persons nor went far into Texas. Settlement size and density in northern Mexico were increasing during this same period, but except for the interest of the local church in gaining Texas converts, Spanish attention was directed elsewhere in the New World.

It took the arrival of a competing European nation, France, to goad the Spanish into examining the lands north of Mexico and east of New Mexico to which they claimed sovereignty on the basis of the coastal and interior expeditions sent before 1550 (Cox 1906; Clark 1902a; Folmer 1953; Priestley 1919). In 1673 Marquette and Joliette had descended the Mississippi from Canada as far as the mouth of the Arkansas River, and from 1681-1682 La Salle also descended the river with 23 Frenchmen, 18 Indians, and their families, going all the way to its mouth on the Gulf Coast (Kellogg 1931). These expeditions gave La Salle the means to convince the French government, specifically Louis XIV, to finance the establishment of a colony on the Gulf Coast, which he proposed be located at the mouth of the Mississippi River.

In 1685 La Salle's colony was founded, but for reasons unknown he landed far to the west of the Mississippi, on Matagorda Bay (Bolton 1924; Cole 1946). With his company of about 180 men, women, and children La Salle established Fort St. Louis, built from the timbers of one of the expedition's ships, which had been wrecked when they entered the Bay. La Salle made several trips from the fort to explore the surrounding region and to look for the true Mississippi, once it was admitted that they had not landed there in the first place. In October 1685 La Salle set out to look for rumored Spanish mines in the vicinity (probably references to those in New Mexico) and returned the following March. In April 1686 he went to search for the Mississippi to the northeast, getting as far as the Hasinai Caddo Confederacy, whom he called the Cenis. These Indians received the French in friendship and sold them horses (Cumming et al. 1974:149). Returning in October to the fort, La Salle had only eight men remaining out of the 20 who had set out with him due to deaths and desertions. The following January La Salle again set out, with about 23 men accompanying him, to reach French settlements on the Illinois so he could resupply and rescue the colonists who remained at Matagorda Bay. La Salle and several of his associates were murdered along the way by dissidents in the party. After additional falling out and more murders, a half dozen of the survivors elected to stay among the Hasinai but six or seven, including Henri Joutel, the primary chronicler of the expedition, pushed on for Canada, with four horses and two "Cenis" Indian guides.

The travelers were the first recorded Europeans to reach the Red River since the De Soto expedition 145 years earlier. They met Nasoni and/or Kadohadacho Indians (Swanton 1952:318), probably west of the Great Bend, between 50 and 100 km upstream from Cedar Grove. Continuing on, they also met Cahinnio Caddo on the Ouachita River, and reached the Arkansas River where they found two Frenchmen, Jean Couture and Delaunay, who had been left at Arkansas Post with four others the previous year by Henri de Tonty. An associate of La Salle, Tonty had tried to reach the Gulf Coast colony via the Mississippi, where La Salle was supposed to have settled. Tonty went down the Mississippi as far as the area in Louisiana inhabited by the Bayogoulas Indians, with whom he left a message for La Salle before returning to the Illinois post (Cumming et al. 1974:150). When Tonty learned of the true location of Ft. St. Louis on the Gulf, he set off in October 1689 to rescue any survivors. By February 1690 he had travelled via the Mississippi and Red Rivers as far as the Natchitoches Caddo villages and with guides continued on to the "Cadadoquis", the Kadohadacho Confederacy (Swanton 1942:43). There he was deserted by all his French companions save one, but he pushed on to Cenis, or Hasinai (Giraud 1974). He soon had to turn back after loss of their gun powder (Cumming et al. 1974:150). This was the last French attempt to relieve the Matagorda Bay colony.

In the meantime, in July 1685 the Spanish had learned of the La Salle expedition when they captured a French ship with a crewmember who had deserted La Salle in port before he left for the Gulf Coast. Alarmed at the potential of French settlement in North America, the Spanish authorities sent out no less than eleven expeditions between 1685 and 1699 to search for and destroy French settlements.

> Four were by sea: one west from Florida, and three east from Mexico. By sea, they explored the coast and discovered harbors; all failed either to identify the mouth of the Mississippi behind its debris, or to find the colony, then still inhabited. (Cummings et al. 1974:152)

As a result, Pensacola Bay was rediscovered in 1693 and protected by the Spanish in 1698 with a small fort (San Carlos de Austria). During the land explorations, Captain Delgado went from Florida (Mission des Apalaches) among the Mobilas Indians, Captain Alonzo de Leon went from El Paso to the seacoast along the Rio Grande, and Captain Retana moved out from Conches after a French deserter, Jean Gery, was captured on the Rio Grande. Retana met the Jumano chief Sabeata, who had evidence of the French Colony (a piece of a French journal, a piece of poetry, and a French drawing of the expedition's ship) as well as news that the colony had been destroyed (Cumming et al. 1974:152). Taking 50 soldiers, Jean Gery, Indian guides, and Father Massanet, Captain de Leon led another overland expedition in 1689 which finally found the destroyed colony and two survivors among the Indians. From them they learned that a smallpox epidemic and then a recent attack by the Indians had killed the people living at the fort.

The following year (1690) Father Massanet fulfilled a promise to the Hasinai Indians he had met on the expedition to Matagorda Bay to return and set up missions. De Leon led 110 soldiers, and Father Massanet led the missionary contingent back to Matagorda Bay where the remains of the French fort were burned. They then traveled to the Nabedache, the westernmost division of the Hasinai Confederacy who were located just west of the Neches River (Bolton 1908:349). There the first two Spanish missions, San Francisco de los Texas and Santisimo Nombre de Maria were established (Gilmore 1978) with three Franciscan missionaries and three soldiers left as staff.

In 1691 the newly appointed Governor of the Spanish Texas territory, Don Domingo Teran de los Rios, led the best organized of the official entradas of the seventeenth century to found additional missions. The official instructions given Teran directed him to establish eight missions, explore and describe the country, and ascertain whether there were any Europeans other than Spaniards in the area (Hatcher 1932). He was specifically instructed to go to the province of the Cadodachos (Kadohadacho) to investigate information that

> a white nation was located to the northward of the river which divides them, where presents of knives, beads, and other things, had been made to the Indians . . . Information shall also be secured in regard to the river above mentioned (Red River) which separates the settlements of the Cadodachos as well as in regard to another very large river which flows two leagues distant from the principal habitation of the Texas Indians. In case it flows toward the Atlantic. . .(Hatcher 1932:7).

Teran left Monclova, Mexico on May 16, 1691 with 50 soldiers, later linking with additional troops and civilian drovers, 10 friars, and three lay brothers on the Sabinas River. The expedition reached the mission of San Francisco de los Texas early in August, and Teran sent troops to search of the reinforcements that were being sent by the Viceroy to Matagorda Bay. The reinforcements had landed there on July 2, and by early September some 40 seamen under a naval lieutenant (alferez), Don Alexandro Bruno, joined Teran at the mission.

Leaving the established missions behind, Teran set off at the end of September to undertake his duties to explore the Caddo lands about the Red River. Father Massanet and two other priests and a lay brother joined Teran in early November. They finally reached the vicinity of the Red River on November 28 and camped among the Caddo living there (Bowie county, Texas) and made a brief exploration of the river (see Appendix IV) before starting back on December 2, 1691. No additional missions were established in the brief visit due to the lateness of the year, the shortage of forage for the stock, and supplies for the explorers, but Teran did provide a limited description of the country and the map drawn of the Caddo settlements on the Red River that became one of the basic documents in the Teran-Soule model of Caddoan settlement used in the research at Cedar Grove.

The missions among the Hasinai were withdrawn in 1693 following poor success in converting the Indians and their growing hostility, in part due to a disastrous epidemic in 1691 which the fathers estimated to have killed nearly 3,000 Caddo. Spanish authorities also had decided that there was no longer any threat of French encroachments in the region. The French, however, had not lost interest in the Gulf Coast and Lower Mississippi Valley, fearing English encroachments that would threaten their posts on the upper Mississippi and the Great Lakes.

In early 1699 Pierre Le Moyne, Seigneur d'Iberville and d'Ardilliere, led a government sponsored expedition which established Fort Maurepas on the Gulf Coastal plain at Biloxi. He left a garrison of under 100 men, and went to France to report. He returned at the beginning of 1700 to explore the lower Mississippi (recovering Tonty's letter to La Salle from the Bayogoulas), establishing another post (Fort of Mississippi or Fort de la Boulaye) 18 leagues from its mouth (Giraud 1974:40). While work on this post was underway, Henri de Tonty arrived from Canada via the Mississippi in 10 canoes with 50 men and furs (Davis 1960:42). Construction of a post to replace Biloxi was begun at the end of 1701 and was well advanced when d'Iberville again left to report to France at the end of April 1702.

The French had arrived just in time to turn back an English vessel in September 1699 which had entered the Mississippi River. However, other French Canadians (coureurs de bois) scattered in the interior were willing to trade with or guide the English. Jean Couture, who had welcomed Joutel and the other La Salle survivors to Arkansas Post, was hired by Governor Blake of South Carolina in 1699 to guide English traders from Savannah down the Tennessee River, and they were trading with the Quapaw on the Arkansas River by February 1701. In 1698 the English trader Captain Thomas Welch had also reached the Quapaw at the mouth of the Arkansas (Cumming et al. 1974:92). Thereafter English goods probably reached tribes living on the east bank of the Mississippi, despite the efforts of French officials to halt this trade and secure the friendship of the Indians.

To explore and further their trade prospects, d'Iberville sent his brother Jean Baptiste le Moyne, Sieur de Bienville, and Louis Juchereau de Saint Denis with 22 Canadians and seven Indians up the Red River in March of 1700, getting as far as a village of Yactaches from whom they learned that the Caddo lands were two days journey farther upriver. Some Caddo Indians visiting there told them that there was a Spanish settlement five days journey to the west (Clark 1902b:5). In May of the same year St. Denis and 25 men were sent west to look for the Spanish, ascending the Red River 70 leagues to the area inhabited by the Natchitoches Caddo, and then possibly on 100 leagues to the west (probably among the Hasinai) where the Indians informed him that they had not seen the Spanish for more than two years. Two other early trips by St. Denis, in 1703 west towards New Mexico, and in 1705 up the Red River, west to the Hasinai, and then to the Rio Grande were possibly indicated in some of St. Denis's records, but no clear account of such trips is known (Clark 1902b)

In 1712 the French government, disturbed at its financial losses in supporting the colony in Louisiana, granted merchant Antoine Crozat a 15 year monopoly on trade. Crozat instructed the Governor of Louisiana, Antoine de la Mothe Cadillac (the same man who had founded Detroit in 1701), to establish profitable trade with the Spanish. Cadillac sent a ship to Vera Cruz, but the Spanish would not allow the ship to land. From nonofficial sources Cadillac learned that the Franciscan friars living on the frontier were desirous of trade contacts with the French.

In 1714 St. Denis again traveled up the Red River, this time with 24 Frenchmen and Indians, to set up a trading

post/fort and establish contact with the Spanish missions. He built a post (Fort St. John the Baptist) at Natchitoches, Louisiana, garrisoned it with 10 men, and then pushed on to the Hasinai territory where he traded with the Indians for Spanish livestock and buffalo hides, before continuing to the San Juan Bautista on the Rio Grande.

His arrival generated an immediate reaction from the Spanish authorities, as had the news of the La Salle expedition in 1685. Authorities in Mexico City authorized an entrada to reestablish missions as a buffer to French territorial expansion and diversion of Indian allegiance. Captain Domingo Ramon was appointed commander of the expedition of 65 persons, which was made up of friars, soldiers and civilians, including married men and their families, with St. Denis as a salaried guide along with two of the Frenchmen from his party. Arriving in the vicinity of the 1690 mission of San Francisco de los Texas, they established a new mission with the same name nearby on July 3, 1716. Moving on they established five more missions, Nuestra Senora de la Purisima Concepcion (1716), San Jose de los Nazonis (1716), Nuestra Senora de Guadalupe de los Nulogdoches (1716), Nuestra Senora de los Dolores de los Ais (1717), and the most easterly, San Miguel de Linares de los Adaes (1717), only seven or so leagues southwest from the French post at Natchitoches. A presidio, also named Nuestra Senora de los Dolores de los Texas (1716), was established as the capital of the region near the Concepcion mission (Gilmore 1978). St Denis went on to Mobile to collect his goods and returned to San Juan Bautista in 1717 to marry and settle, but later returned to Natchitoches after problems with the Spanish authorities. In 1718 Governor Alarcon made an inspection tour of the missions, bringing supplies, and establishing a mission (San Antonio de Valero), village (Villa de Bexar), and presidio (San Antonio de Bexar), as a midway station between the posts among the Caddo and Mexico. Though the number of Spanish posts were greatly increased, they were served by only a few friars, settlers, and perhaps a total of 25 soldiers described by the priests as "mere boys, poorly clad, without mount or arms, a laughing stock to the very Indians" (Buckley 1911:13).

When news of war between France and Spain (declared January 9, 1719) reached Bienville in Mobile he attacked Pensacola to the consternation of the Spanish who had not yet heard news of the war. While the Spanish regained the post in August, the French retook the post in September and did not return it to Spain until 1721. In June 1719 with news of war, Lieutenant Blondel in command of only a few soldiers at Natchitoches took it on himself to go to the Spanish mission at Los Adaes. He captured the lone Spanish soldier there, but the priest escaped with the news that created a panic among the other east Texas missions. They were all abandoned between June and September, retreating to the missions and presidio on the San Antonio river (Buckley 1911). Benard de la Harpe, who had just gone upstream from Natchitoches to establish a French post among the "Nassonites, Cadodaquious, Nadsoos, and Nagodoches" (Smith 1959:75) rebuked Blondel for upsetting the trade relations and profit generated from it, and wrote the priests requesting that they return.

La Harpe had been given a grant of land above Natchitoches on the Red River, and was instructed by the Council of Louisiana in 1718 to trade with the Spanish and explore the region about his grant. He was to be reimbursed by John Law's Company of the West which in 1717 had acquired a trade monopoly similar to and supplanting Crozat's grant. La Harpe left New Orleans (only recently founded) in December 1718, and reached Natchitoches the following February. He had continued up river, leaving the Red at the Sulphur River, to travel up it and its tributaries to a portage which led him to McKinney Bayou, and then to his destination among the upper Nasoni where he arrived in early April 1719 (Wedel 1978). This path was a bypass recommended by his Indian guides, some 37 leagues shorter than the Red River course. "It was evidently the customary route taken by the Natchitoches when they went to the settlements above the Great Bend" (Wedel 1978:3). It completely bypassed the Spirit Lake locality, which was passed by the boats bringing La Harpe's supplies. The crew left no known written record of that part of the trip on the Great Bend of the Red River. The small post established by La Harpe stayed in operation well beyond the occupation at Cedar Grove, extending into the late eighteenth century (Miroir et al. 1973:162).

At the same time that La Harpe learned of the hostilities between France and Spain in June 1719, the Spanish were preparing to reinforce their missions in Texas. The newly appointed Governor, Marques de San Miguel de Aguayo, was organizing the largest of the Spanish entradas ever to go among the Caddo. Some 500 soldiers plus missionaries, and livestock herds with thousands of horses and other animals were being assembled in northern Mexico (Buckley 1911). The logistics of assembling such a large force, plus a period of bad weather which created flooding delayed the larger part of the force from departing the Rio Grande until the end of March 1721. By this time a truce had been declared between France and Spain. The reestablishment of the abandoned missions was completed that year at San Francisco de los Texas, (rededicated as San Francisco de los Neches), Nuestra Senora de la Purisima Concepcion, Nuestra Senora de Guadalupe de los Nacogdoches, San Jose de los Nazonis, Nuestra Senora de los Dolores de los Ais, and San Miguel de Linares de los Adaes. Aguayo reestablished the presidio at los Texas and built a new presidio, Nuestra Senora de Pilar de los Adaes, at the most easterly mission, which he garrisoned with 100 men and a cannon. The combined mission, presidio, and village at los Adaes was made the new capital of Texas.

On the return trip in 1722 Aguayo also established a presidio on Matagorda Bay in addition to the mission he had founded there the previous year. A new mission, San Francisco Xavier de Najera, was built at San Antonio, in addition to the new one founded there two years earlier, San Jose y San Miguel de Aguayo.

These settlements were well supplied for a while, but by the time General Pedro Rivera made an inspection trip into Texas in 1727-1728, he found them all in bad condition and recommended that the presidio at Nuestra Senora de los Dolores de los Texas be abandoned and that the strength of troops at all other posts be halved, which was done in 1729 despite the protests of the missionaries (Garrison 1903:86). In 1731 the Queretaran friars abandoned voluntarily the missions at Nuestra Padre San Francisco de los Neches, San Jose de los Nazonis, and Nuestra Senora de los Dolores de los Ais, withdrawing to the settlement at San Antonio and leaving only the settlements at los Adaes, and Concepcion and Guadalupe missions east of the San Antonio River. These settlements remained until near the end of 1772 when they were withdrawn in a government reorganization of Texas (Gilmore 1978).

While these developments were taking place within the Caddoan area, the French were attempting to expand their occupation along the Mississippi River and its tributaries. Fort Rosalie was established at Natchez in 1716, the portage at Point Coupee, Louisiana was settled in the early decades of the eighteenth century (Brain 1979:268), and a settlement was made at Yazoo in 1720. Arkansas Post, abandoned in 1702, was resettled in 1721 with a colony of 80 German farmers from New Orleans and a small garrison of French troops nearby at the Quapaw village of Osotouy (Martin 1978:1). Other German/Swiss colonists settled north of New Orleans. In 1719 Charles du Tisne founded Fort Ferdinandia, a trading post on the Arkansas River at the mouth of Deer Creek (Kay County, Oklahoma; McRill 1963). Expansion of the colony experienced a severe setback in December 1729 when the Natchez Indians, disgruntled over poor treatment they had received from French officials, staged an uprising in which hundreds of colonists, from the vicinity of Yazoo to Fort Rosalie, were killed. The French unsuccessfully retaliated in 1730, but in 1731 they destroyed the Natchez towns and broke their power. However, this massacre was the final act which convinced the Directors

of the Company of the Indies (the replacement of the Company of the West which had been in financial difficulty since 1720), to request to be divested of its charter. They paid the French Crown for the release (Davis 1960:61-62). With the failure of the parent company in 1731, the people at Arkansas Post abandoned their settlement so, at the end of the occupation period for Cedar Grove the French Government again assumed responsibility for Louisiana. At that time the European population of the colony from Mobile Bay, up the Mississippi River to Arkansas Post, and up to the Red River posts, "was estimated as high as 7,500 persons, including Negro slaves" (Davis 1960:62). The Spanish were present in Texas missions from Los Adaes to the Rio Grande with a substantial population south of that river in Mexico, and to the west in New Mexico.

Table 5-1. Cedar Grove's distance from European posts (1670-1730)

Date of Occupation	Post	Distance* from Cedar Grove (km)
1670	none	within 600
1685-1689	Ft. St. Louis	over 600
1687-1702	Arkansas Post	over 230
1690-1693	Texas missions	under 200
1699-1710	Ft. Maurepas	over 550
1700-1730	Ft. Mississippi	over 550
1714-1730	Natchitoches	under 200
1716-1729	Ft. Rosalie	under 300
1717-1720	Texas missions	under 200
1718-1730	New Orleans	over 500
1719-1730	Nassonite Post	ca 70
1720-1729	Yazoo	under 300
1721-1730	Arkansas Post	over 230
1721-1730	Texas missions	under 200

*straight line distance

ASSESSMENT OF THE HISTORICAL PERIOD

People

The primary observations to be made from the chronological record of European exploration and settlement of the Caddoan region surrounding the Cedar Grove site are that European settlements progressively got closer to the site (Table 5-1), and were growing in size. However, few recorded direct contacts were made with the Caddo living along the Great Bend of the Red River. In fact, there is no known European description of an encounter with the Caddo in the Spirit Lake or Boyd Hill archeological localities until after the Cedar Grove site had been long abandoned. The De Soto expedition may have reached the Red River in 1542, but it is unclear where. Joutel's party of La Salle colony survivors reached the Red River Caddo in 1687 (the upper Kadohadacho), but probably well upstream from the Cedar Grove site. It appears that Tonty in 1690 did get upriver to the Arkansas Great Bend Caddo in his rescue attempt for the La Salle colony. The Teran expedition of 1691 definitely reached the upper Kadohadacho, well upriver from the Spirit Lake locality. It is known that starting in 1719 the French began shipping supplies up the Red River through the Great Bend, to the post La Harpe established among the Nasoni/upper Kadohadacho in northeast Texas. However, La Harpe personally took an established Indian route that totally bypassed the Great Bend, so his journal never records the Spirit Lake locality. After 1719 it is safe to assume that French boats with trade goods were going up and down the Red River to supply the Nassonite post, but there is no direct documentation of trading with or gifts given to the Indians along the route. Of all the Indian groups inhabiting the Caddoan region the Kadohadacho living on Great Bend in Arkansas were the last to experience regular face-to-face contact with Europeans within the area where they resided.

In terms of the locations of the European posts, the Kadohadacho on the Arkansas position of the Great Bend were also living the furthest distance from any direct source of European goods. Table 5-1 is a chronological summary of the principal European posts located within 650 km (straight line distance) of the Cedar Grove site between 1670 and 1730. Of course, the paths traveled between different places was rarely the shortest straight line distance, as many meandering rivers and creeks were often used for transportation, or had to be forded when traveling overland. At the beginning of the occupation of the Cedar Grove site there was not a single European inhabited establishment within 650 km. Fort St. Louis on Matagorda Bay, from which Joutel and his party reached the upper Kadohadacho in 1687, was about 600 km from Cedar Grove. The closest post to the Cedar Grove site before 1700 were the two Spanish missions among the Hasinai between 1690-1693 (just under 200 km from Cedar Grove) which were reoccupied and extended somewhat closer in 1717-1719 and between 1721-1731. Arkansas Post, occupied between 1686-1702 and 1721-1731, was somewhat farther away (over 230 km) to the northeast in straight line distance. Early French settlements at Biloxi and New Orleans were between 500 and 600 km away until the Natchitoches post was established in 1714, within 200 km of the site. Finally, the Nassonite post of 1719 was established around 70 km away from Cedar Grove. Other French posts founded on the Mississippi River between Arkansas Post and New Orleans after 1719 were probably at best secondary sources of European contact with closer establishments among the Nassonites and at Natchitoches.

Products

While Europeans themselves arrived late in the contact era in the Great Bend region, their products preceded them as noted for the Caddo in general. These products can be separated into three categories: (1) dry goods which the Indians could not produce for themselves; (2) livestock which once obtained could be raised without further European assistance, or could survive in the wild on their own; and (3) disease. Since contacts with Europeans within the Arkansas Great Bend region were limited, products obtained by the Caddo living there came from travel to European posts or Indian middlemen traders, visits from Indian middlemen traders to the Great Bend region, giftgiving between and within tribes, theft from other Indian groups, or warfare with other Indian groups, both inside and outside the Caddo home territory. This is particularly true of the period before 1719 and perhaps even for some years after the founding of Nassonite post, the French establishment closest to the Arkansas Kadohadacho.

Clearly the Kadohadacho were capable of traveling long distances for hunting, warfare, visiting, and trading. They were familiar with canoes for water transportation, and used overland traces as well. The ability to travel overland may have been enhanced once the Caddo obtained horses. The Kadonadacho visiting the Hasinai when Aguayo reestablished the Spanish missions there in 1721 were well over 100 km away from home at minimum. On reaching the Quapaw villages at the mouth of the Arkansas River in January, 1690, Henri de Tonty "was given two Kadohadacho women to take along as he was bound for their country" (Swanton 1942:42). Farther along on his trip up the Red River Tonty asked for guides from the Natchitoches to take him to the "Cadodoquis," some 200 km away. "They were very unwilling to give us any, as they had murdered three ambassadors about four days before who came to their nation to make peace" (Swanton 1942:42). Since the Caddo were known to travel far and wide, we must entertain the possibility that the Great Bend Region inhabitants were

exposed to Indian carriers of European introduced diseases, as well as to the few Europeans who entered the area between 1500 and 1730.

While the Hernando de Soto expedition is suspected of having caused population declines among the contacted natives, there is no satisfactory direct evidence of this at present except for the reduced populations noted by the French when they entered the Mississippi Valley over 100 years later. However, the 1528 epidemic, possibly cholera (Ewers 1973:107), among the Texas coastal Karankawan tribes was coeval with the arrival of the Spanish survivors of the Narvaez expedition. A smallpox epidemic in 1688-89 killed many of the French colonists at Fort St. Louis on the coast before the survivors were massacred. Some 3,000 Hasinai Caddo were estimated by Spanish missionaries to have died, a result of contact with the Europeans who came to live among them in 1691. In the Mississippi Valley d'Iberville noted that the Biloxis and Pascagoulas were partially wiped out by disease between 1699-1700 (Giraud 1974:78).

The closest any of these known epidemics came to the Cedar Grove site is the 1691 epidemic among the Hasinai, some 200 km away. At present, based on either documentary or archeological data, it is not possible to specify whether any of these known epidemics or other unidentified epidemics reached the Arkansas Great Bend region before 1730. The dispersed settlement system of the Caddo would have to some extent sheltered them from the severe impact an epidemic can have in a densely populated settlement. Proximity of the Hasinai to the Spanish missions in 1691 and frequent visits by their scattered population to the two missions may have helped to spread the disease there.

European animals and material culture became available to coastal Indians bordering the Caddoan area almost with the first explorations of the Gulf Coast. As European settlements increased, several different areas could have been the source for goods reaching the Great Bend Caddo through intermediary tribes (Table 5-2). After coastal sources, Spanish Mexico and New Mexico became a major supply source for Indians of the Trans-Mississippi South and southern Great Plains. The three episodes of Spanish missions in Texas put the supply source among the Hasinai. French goods (other than shipwrecks) were available first coming down the Mississippi from their posts on the Great Lakes (though this was probably limited in quantity), and then from the Mississippi Valley after 1700, and eventually the Red River after 1714. The 1719 post on the Arkansas River in northern Oklahoma could have been an indirect source of material goods, but it was unlikely to have been much of a source. Limited English goods may have come across the Mississippi from the Tennessee River after 1698. In terms of established settlements as sources of goods the Great Bend Caddo could have been receiving materials from three different European countries, who obtained goods all over Europe, explored Africa and the Far East (Table 5-2). As the source of supply got closer to the Great Bend, we can safely assume that the most proximal loci among the Spanish missions in northeast Texas and the French posts on the Red River became the primary sources of dry goods.

The historic records are clear that cattle, horses, and mules came from Spanish sources in Texas, Mexico, and New Mexico, and that the French traded with the Indians to obtain such livestock. Spanish animals were lost in the New Mexico, northern Mexico, and Texas, and they were rapidly acquired by the local Indians, setting in motion the *equestrian Plains* adaptation of buffalo hunting, and possibly trade and warfare with other aboriginal groups who did not have as much direct access to horses. Among the other livestock introduced by the Spanish, swine (such as De Soto brought) and cattle were probably the animals most likely to survive in the wild if they escaped from their domesticated herds. This was common according to the historic documents.

European technology could have became available early in the exploratory period. Narvaez in 1528 saw shoes,

Table 5-2. Potential source areas of European goods (1500-1730)

Dates	Region	Country
1500-1730	Gulf Coast	Spain, France and England
1550-1730	Mexico, New Mexico	Spain
1650-1730	Great Lakes/Mississippi	France
1690-1693	Eastern Texas	Spain
1698-1730	Mississippi Valley	England
1699-1730	Lower Mississippi	France
1714-1730	Red River	France
1716-1719	Eastern Texas	Spain
1721-1730	Eastern Texas	Spain

broadcloth, and iron obtained from a shipwreck in a deserted village. Both shipwrecks and desertions were commonplace, and many more opportunities for cultural contact were probably present than are usually described (Morse 1981:72). Some of the shipwreck material could also have come from French and English pirate vessels, that preyed on the Spanish treasure fleets and attacked Spanish settlements in the Caribbean and Mesoamerica. Traditional aboriginal trading routes to the coast and to the west and east supplied a ready means for the diffusion of the European products that came into the hands of the Native peoples the Caddo interacted with.

Historic records provide some measure of a filtering effect of the various native groups who were geographically placed to act as middlemen in the distribution of European goods. Population estimation of aboriginal populations from ethnohistoric documents has been argued over by both historians and anthropologists since Mooney's (1928) landmark attempt to establish aboriginal populations in North American between *1600 and 1700*. Mooney's figures were revised upward by Kroeber (1939) and Rosenblat (1967; summarizing earlier studies), but all were criticized for being conservative in their estimates by Dobyns (1966) (Jacobs 1974). Nonetheless, Mooney's conservative estimates of a population already modified by European influence can provide a starting point for depicting the scope of the filtering effect at specific time periods.

To the northeast of the Caddo on the Arkansas River, Mooney estimates 2500 Arkanas or Quapaw in 1650. Between the Caddo and French sources of supply in the lower Mississippi Valley Mooney lists eleven "tribal" groups in 1650, with a total population of 10,700 persons. To the east in Mississippi the same year he puts seven tribal groups with a combined total of 29,500 persons; these groups would have filtered English goods coming from the Atlantic coast, French goods from the Gulf coast, and Spanish goods from both the Gulf coast and Florida settlements. Between the Caddo and Spanish establishments in Mexico and New Mexico (including the southern plains and the Texas Gulf Coast) Mooney estimates 25,000 Indians in 1690, in 11 groups not including Pueblo Indians in immediate contact with the Spanish in New Mexico. Mooney listed a combined population for the Caddo in 1690 of 8500 persons, which does not separate out the major confederacies. This gives an estimate of 57,000 Indians filtering trade goods before they reach the Caddo, and over 60,000 between the Great Bend Kadohadacho and a European settlement until 1719, taking into account the known epidemic that killed some 3,000 Caddo in 1691.

The filtering effect would have been greatest during the earlier years of the contact era due to several factors. First, the Kadohadacho were farthest removed from the sources of European dry goods. Second, native populations between the Kadohadacho and these sources were intact, undiminished by European diseases. Lastly, due to the novelty of these goods, Indians with direct access would

have been reluctant to part with newly acquired goods they found of value. As time went on, the filtering effect was diminished for the Kadohadacho due to the greater proximity of European sources and the population declines caused by European diseases. However it may have been upheld by intermediary Indian groups attempting to establish and maintain themselves as middlemen in the traffic for European products. After the 1650 expedition of Hernando Martin and Diego del Castillo across the Rio Grande into Texas,

> trading relations seem to have continued between the Spaniards and the Jumano, and it is safe to conclude that the latter soon assumed that profitable position as middlemen in passing on European goods to the Hasinai, which we find them occupying in 1676 (Swanton 1942:36).

One Jumano captain, Juan Sabeata, around this time period every spring

> was in the habit of leading his followers to the east to hunt buffalo and to trade with the friendly Indians of the Hasinai Confederacy on the Neches and Trinity Rivers of East Texas. Here it appears that each year the Indians held a fair in which the plunder obtained from the Spanish outposts along the whole northern frontier of New Spain was bartered and traded. In the fall, before cold weather set in, Juan Sabeata led his people back to the region of La Hunta de los Rios (a Presidio opposite the mouth of the Conchos) where they spent the winter (Castaneda 1936:326) (Swanton 1942:37).

Gregory's (1973) study of archeological data and historic records led him to conclude that between 1600 and 1700 trade was well established between Puebloan and Caddoan Indians, and that European goods were then primarily coming from Spanish sources to the southwest, but virtually no trade items were passing beyond the Hasinai except for horses. Both the filtering effects and the kinds of European products available are reflected in historic records. Anastasius, who accompanied La Salle on his 1686 search from Fort St. Louis for the Mississippi, described the Spanish goods they saw among the Hasinai in May or June:

> We found among the Cenis many things which undoubtedly came from the Spaniards, such as dollars, and other pieces of money, silver spoons, lace of every kind, clothes, and horses. We saw, among other things, a bull from Rome, exempting the Spaniards in Mexico from fasting during summer. Horses are common; they gave them to us for an ax; one Cenis offered me one for our cowl, to which he took a fancy (Swanton 1942:39).

When Joutel reached the Hasinai the following year he was met by three Indians, one on horseback, and one dressed in the Spanish manner,

> having a little doublet or jacket the body of which was blue and the sleeves white, as if worked on a kind of fustian; he had very well fitted breeches, stockings of white worsted, woolen garters, and a Spanish hat, flat and wide in shape. He also claimed to have visited the Spaniards in person . . . .
>
> There were seven or eight who had sword-blades, with big bunches of feathers on the handles. These blades were squared like those of the Spaniards; they also had many big hawkbells, which made a noise like those on mules . . . Some also had some pieces of blue stuff, which they had gotten from the Spaniards . . . .
>
> What I understood very well was their taste for knives and axes, which they love very much and of which they have great need, not having any at all, although they have been to visit the Spaniards, which enables one to see that the latter do not give them much. Except that the women have some pieces of very coarse blue cloth of which they make a sort of small coat, which they wear in front and behind, but there are few of them (Swanton 1942:194).

Proceeding on to the Nasoni on the Texas end of the Great Bend Joutel remarked that

> those Indians and all of the tribes to the west of them had horses while those to the east did not, but noted an exception in the case of the Cahinnio on the Ouachita River who had two very fine gray horses. The source of supply was plainly shown by the horses which they themselves secured. Some were marked on the thighs, which must have been done by farriers, and two of them even were geldings (Swanton 1942:194).

Also beyond the Kadohadacho villages, among the Cahinnio Caddo on the Ouachita, Joutel noted other Spanish goods in limited amounts:

> Having stopped to eat on the banks of a river, we heard the noise of some hawkbells or house bells, which made us look around when we perceived a savage with a naked sword in his hand, ornamented with feathers of different colors, and two hawkbells which were making the noise that we had heard. He signed to us to approach and informed us that he had been delegated by the old men of the village whither we were going to come to us. He made many friendly gestures. I observed that this sword was Spanish and that it gave him pleasure to make the bells ring (Swanton 1942:179).

Three years later in 1690 when Tonty reached the "Cadodoquis" on the Red River he stated that they possessed about 30 horses, which they called "cavali" from the Spanish caballo (Swanton 1942:42). Going to the south among the Hasinai ("Naouadiche") to search for deserters from the La Salle colony he was told by the Indians he met

> that they had accompanied their chiefs to fight against the Spaniards, seven days' journey off, that the Spaniards had surrounded them with their cavalry, and that their chief having spoken in their favor, the Spaniards had given them horses and arms. Some of the others told me that the Quanouatins had killed three of them, and that the four others were gone in search of iron arrow-heads (Swanton 1942:43-44).

Joutel decided that these Indians had killed the Frenchmen he was looking for, determined to retrace his journey and traded for mounts:

> I told the chief I wanted four horses for my return, and, having given him seven hatchets and a string of large glass beads, I received the next day four Spanish horses, two of which were marked on the haunch with an R and a crown (couronne fermee) and another with an N. Horses are very common among them. There is not a cabin which has not four or five. As this nation is sometimes at peace and sometimes at war with the neighboring Spaniards, they take advantage of a war to carry off the horses (Swanton 1942:44).

From these descriptions of both the Hasinai and a western tribe of the Kadohadacho Confederacy in 1687, and then 1690, evidently the European goods coming to the Hasinai were going to the Kadohadacho in limited amounts, but there were more livestock seen among the Kadohadacho at the later date. The Kadohadocho got the horses from the Hasinai who had acquired them as gifts, through trade, and in raids from the Spanish. After 1714 the filtering effect probably diminished for the Kadohadacho with the establishment of French trading posts on the Red River.

Such filtering was not unique to the Caddoan region; it was a major factor in the fur trade wars that broke out between 1600 and 1650 in the Northeast among the aboriginal groups competing for the middleman position in the beaver trade. The Iroquois emerged victorious by destroying their competitors' villages and adopting the survivors who did not flee.

Population estimates also provide one explanation for the general dearth of European products recovered archeologically from contact era Caddo sites. Swanton (1942:22-23) outlined various historic accounts that gave population estimates for different Caddoan groups, usually in terms of the number of warriors, from which the total population was extrapolated using an estimated average nuclear family size of four persons. The estimates for the Hasinai in 1699 were for a population of 2,400-2,890, and for the Kadohadacho in 1700 some 2,000-2,400 persons. Archeologically recovered Caddo skeletal populations from these two confederacies for the entire contact era give only a minute sample of the potential burial assemblage, and excavations of habitation areas likewise can only represent a tiny fraction of the debris left behind by these people. Is it any wonder then, that archeologists have little to show to date in the way of archeologically recovered European products on contact era Caddo sites? Of course, the destructive forces of post-Caddoan land use by Euramericans combined with sites lost to pothunting, vandalism, and natural processes such as river meandering progressively reduce the size of the data pool still in existence in the ground. Archeologists have to date been mostly unsuccessful in identifying and adequately recovering reliable samples of contact era Caddoan sites, particularly on floodplains where sites can be buried as well as cut away. The Cedar Grove and Sentell sites are two cases in point; both of these loci were invisible to surface or bank line inspection methods and were not disclosed until construction cut away the flood overburden that disguised them. The Cedar Grove site is the first contact era site of its age ever professionally investigated in the Spirit Lake locality. The continuing process of deterioration in the ground suffered by some classes of products (organics, metal, etc.) is slowly destroying in place the evidence of contact in remaining undisturbed loci. Sites lie in a variety of soil contexts which create different conditions for preservation, leading to a varied archeological record even had the inventory of goods originally deposited been consistent on similar kinds of sites.

Given the general climatic and soil conditions of the Caddoan area in general and the Red River Valley in particular, it is unlikely that some kinds of European products will be preserved except in rare accidental coincidences, as when a piece of fabric next to a piece of copper is preserved by the association. Historic records specifically indicate that products made out of perishable goods, such as ribbon or cloth were important items utilized as gifts for or in trade to the Caddo. The Caddo received both unfinished bolts of fabric and European style clothing. Already quoted above is the Anastasius description of Spanish goods among the Hasinai in 1686 which included perishable lace, clothing, and even a paper document. Joutel saw a complete Spanish outfit among the Hasinai the next year, including a jacket, breeches, stockings, garters, and a hat, along with garments the Indian women made for themselves out of cloth.

During the Teran expedition of 1691 blankets were given to the Indians, and some goods were distributed along status and sex lines. Women were given rosaries, earrings, glass beads, and red ribbons, while men received tobacco, pocket knives and other cutlery (Hatcher 1932). One captain was given a gun with powder and balls, a gift at odds with the Spanish general policy not to distribute firearms to the Indians. In the 1709 Espinos-Olivares Aguirre expedition across the Rio Grande did not reach the Caddo, but tobacco and a silver mounted cane reportedly were given to an Indian captain. The Ramon expedition in 1716 distributed clothing, "blankets, sombreros, tobacco, and flannel for undergarments" (Tous 1930:21). Captain Ramon described a distribution on June 29, 1716 to 150 Indians:

> I ordered that they be given 100 yards of sackcloth, 40 blankets, 30 hats and 12 packages of tobacco, which were placed in a pile for them to divide among themselves (Foik 1933:21).

Some gunpowder was also distributed to the Indians, many of whom had French firearms. On June 27, 1716 St. Denis returned to the main expedition after scouting ahead, with a group of 25 men, most of them captains. Captain Ramon narrates:

> There came forward in single file more Indians on horseback, headed by Don Louis (St. Denis). These Indians carried nine long shotguns, all of French make (Foik 1933:19).

These gifts were small in volume compared to the lavishness of the 1721 Aguayo expedition that refounded the Spanish missions. Tobacco and food (including live cattle) were generally the initial gifts given the Indians encountered to bring them together for a more formal gift distribution. Don Juan Antonio de la Pena, a member of the expedition, described the various gift distributions in detail. In early July 1721 on the Trinity river many gifts were given:

> His Lordship, besides supplying them with food all the time they remained, gave them clothes and other things; and, after fitting out in a special manner the captains, he sent clothes, knives, and other articles which they prize highly to all those at the rancheria. . . . (Forrestal 1935:38).

Among the nonlocal Indians were four Texas (Caddo) and Ygodosa Indians who were also "clothed in a special manner in order that they might spread the report that the Spaniards had entered (that country) in a friendly manner" (Forrestal 1935:38). Meeting the Cacique of the Hasinai, who was recognized by all the Texas tribes as their "superior", with a party of eight chiefs and four women, Aguayo clothed the cacique in

> a long coat, a jacket and woolen breeches, presented him with a silver-headed baton, and named him captain and governor of the Texas Indians. He clothed, in like manner, all the other men and women who accompanied the cacique (Forrestal 1935:39).

Meeting 100 Nacono Indians, including women and children accompanied by their Captain, who was also described as the chief priest of their idols, Aguayo distributed more clothes on July 31, 1716:

> This same day his lordship clothed all the men and women in coarse woolen garments and small cloakes with ribbons, and presented them with glass beads, knives, ear-rings, finger-rings, mirrors, combs, and scissors, chain-links, and blankets, all of which they treasure highly. To the captain he gave a silver-headed baton, a suit in keeping with his office and made in the Spanish style, and to his wife he gave double the quantity he had given the

> others. All were very much pleased and very grateful (Forrestal 1935:42).

Continuing on to the Neches of the Hasinai Confederacy another 150 men, women and children were completely fitted out, with a baton and full suit of Spanish style presented to the captain. By August 6 the expedition reached the site of the Concepcion mission, where to the captain of the Texas Aguayo presented

> the best suit which he had and which was of a blue color and beautifully braided with gold. He gave him a jacket trimmed with gold and silver cloth and everything necessary to make a complete suit (Forrestal 1935:46).

Cheocas, the Texas captain, was asked to bring his people in from their scattered residence for a great gift distribution at the Concepcion mission. In attendance were

> about eighty Cadodachos. The latter, who are subjects of the French, had come with the Texas, whose governor lives here. . . . After the captain-governor of all the Texas had assembled the Asinais, who attend the Concepcion Mission, and the 80 Cadodachos, he brought them, many of them carrying guns, to his Lordship's camp. . . . He then clothed, completely and after their fashion 400 of the Indians, and to each gave gifts which they prize highly: knives, combs, awls, scissors, mirrors, belduques (large knives), chain links, chochomites, belts, necklaces, ear-rings, glass beads, and finger rings. He clothed also two captains that accompanied the Cadodachos and gave them a bundle of clothing and articles of merchandise to distribute among their Indians. (Forrestal 1935:46-48).

The same pattern was repeated at Mission de San Jose de los Nazonis, distributing clothes to 300 Indians and a special suit of Spanish cloth and styling and a silver-headed baton to their captain. At the los Adaes mission over 400 Indians were given presents and the captain was especially clothed.

In total, Aguayo distributed clothing to somewhere between one and two thousand Indians, with special garments being reserved for the Indian captains and their immediate retainers. Both Spanish and English cloth were used to make the clothing that was distributed. During the same period, the French were also distributing goods made out of cloth. When St. Denis returned to San Juan Bautista to settle in 1717 his goods were temporarily seized and itemized by the Spanish authorities. The list included nothing but cloth goods, including Brittany linen, red and blue woolen hose, Flemish thread, laces, green and blue twill, Brussels camlet, scarlet cloth, heavy French satin, Rouen linen, and blue wool (Shelby 1923). A list of goods intended for Indian gifts shipped to the Louisiana colony in 1701 included 30 red overcoats and 150 white shirts (Gerin-Lajoie 1979:291). At La Harpe's post on the Red River he wrote in 1719 that he carried "all the merchandise of Europe" including at least Brittany and Damask cloth (Smith 1959:257). The historic records strongly indicate that cloth goods, both unfinished and finished, were a regular trade and gift item available to the Caddo from both the French and Spanish.

People and Products

The historic records also make it explicit that Caddo society during the contact era was one of inherited rank. When Teran reached the Red River in the winter of 1691 he met the Caddo leader on November 28.

> We proceeded from this place and we made camp at the home of an Indian whom they called Caddi, . . . He was a young fellow about twelve or fourteen years of age, very good looking, and apparently quite friendly. . . . On the 30th, it was not possible to carry the canoe to the river, because the interpreter told me that the Caddi was displeased because I had left his home. On this point, I may state that he had control and authority over the two captains of his tribe, whom I mentioned as being among the Asinay. Besides these two allies he has five other captains who follow his lead, making seven in all. Each of these captains recognize the authority of the Caddi. I studied this Caddi and found that he also had a considerable following of strong robust troops, all friendly among themselves. I noticed this resentment, and this forced me to return and set up camps at his rancheria (Hatcher 1932:33-34).

Recognizing the different status of the leader, the Teran narrative continues:

> On December 1st, after the Caddi had seen my willingness to meet his wishes, and my appreciation of his feelings, he summoned an older brother of his to approach and receive the baton, emblem of authority--it being the custom for the youngest to thus bestow it--and ordered this brother to go to the aforesaid lagoon in company with certain Indians and aid us in carrying the canoe to the river. . . . During this visit I noticed the respect showed the Caddi by the Indians. They offered him a seat as soon as they saw him, a deference they did not show in the case of the others who accompanied us. I noticed too, that they had a captain, but that he is under the orders of the Caddi, the latter being the arbiter and ruler of the entire nation (Hatcher 1932:34-35).

This document on the Kadohadacho and those summarized for the Hasinai (Wyckoff and Baugh 1980) indicate that both groups of Caddo Indians had similarly structured societies and inherited elite positions with differential access to material goods and services. Therefore, even when European products were available to Caddo society as a whole, it is probable that the social system would have taken over the distribution of valued European products, just as they had done for status goods of native manufacture. Gregory (1973) wrote that between 1600 and 1700 scarcity was still the important factor in the definition of Caddo wealth, with exotic items from outside the immediate area being incorporated as part of traditional Caddoan funerary practices. He suggested that the horse became a functional equivalent of Gulf Coast conch shell goods and copper found in earlier Caddo burial contexts. After 1700 with goods becoming more available he argued that the evidence then available archeologically showed no clear indicators of status in burials, even though European materials were replacing those of native manufacture as grave goods as time progressed; this was interpreted as a post 1700 trend to more egalitarianism in Caddo society as the regional groupings of the Caddo were broken down by declining population (Gregory 1973:288).

THE GREAT BEND CONTACT ERA MODEL

The preceding discussion of the historic records pertaining to the chronology of European entradas and the establishment of settlements, the kinds of products made available to the Indians, and the possible effects of epidemics, filtering, and status among the Caddo has brought us full circle to where the discussion in this chapter began, concerning the identification of a diachronic model for culture contact in the Arkansas Great Bend region, specifically the Boyd Hill and Spirit Lake

archeological localities and more generally the Kadohadacho confederacy on the entire Great Bend. Based on the review the following general conclusions can be summarized:

1. The Kadohadacho were the last of the Caddo confederacies to meet Europeans in face-to-face contact.
2. The Kadohadacho were located the farthest from any European posts until 1719 when the La Harpe Nassonite post was built on the Red River. Before that time other native groups filtered the flow of European products to the Kadohadacho.
3. The Kadohadacho's ranked society controlled access to European products that were available, although as time progressed it is likely that this control lessened as the society came under stress due to the effects of disease and greater availability of goods.
4. European products that were available to the Kadohadacho often consisted of goods (cloth/ribbons) that are unlikely to have survived in the archeological record except in rare preservation coincidences.

As a specific subarea within the region inhabited by the Kadohadacho confederacy, the Spirit Lake and Boyd Hill archeological localities varied from the Little River phase locality upriver in having fewer recorded direct contacts with Europeans, and being farthest from European posts of any Caddoan group, let alone the Kadohadacho. Based on these conclusions a diachronic model for the contact era in the Spirit Lake and Boyd Hill archeological localities can now be outlined. For ease of reference in the future, I shall name this the "Great Bend contact era model."

As European contact was late and infrequent in the Arkansas Great Bend region, we expect that European products were available only in limited amounts (as compared to other Caddoan subregions) before the 1719 establishment of the Nassonite post. Also the relative isolation and scattered settlement system protected localities from epidemics. The population did not decline as rapidly as other Caddoan groups in more regular contact with Europeans. Because the negative effects of contact were delayed until after the first quarter of the eighteenth century, it is expected that the ranked social structure persisted in strength until at least 1730. In the precontact era the Arkansas Great Bend region was the heartland of Caddoan ceremonial mound development on the Red River. The archeological evidence supports the premise that hierarchical social structure had deep roots in this subarea. As a result, when European dry goods and livestock came into the Arkansas Great Bend region in limited amounts, in general, they would have been treated as exotic items reserved for the upper echelons of the society. As the availability of goods increased, their value as exotic status markers would have declined, coincidentally with a declining population and weakened social structure.

The archeological manifestations reflecting this model would include a general dearth of European products throughout the area inhabited by the Kadohadacho confederacy from 1500 to 1685. After 1685 increasing European contacts would come primarily among the upper Kadohadacho tribes, and European dry goods might be found in limited amounts in early Little River phase sites. After the establishment of the French post at Natchitoches in 1714 we could expect more trade goods, with increasing amounts after 1719 following the establishment of the French post among the Nassonites. Proximity to these posts and the Spanish missions would indicate that more trade goods should be found from the first 20 years of the eighteenth century in sites of the Little River phase upriver as compared to sites of the Chakanina phase. To date the site on the Great Bend which has yielded the most reported European products is Rosebrough Lake (41BW5) in northeast Texas which has been suggested as the site of La Harpe's post (Miroir et al. 1973).

Until at least 1719, and probably until 1730, few archeological manifestations of European products would be expected to be found in general midden or garbage disposal contexts in the Great Bend region. European objects would have been treated as exotic goods which were reserved for the use of the social elite, who would have conserved them carefully. Such goods would enter the archeological record as grave goods with higher status individuals, or perhaps as special graves for European livestock, as with the horses buried at the Fish Hatchery site near the French post at Natchitoches, Louisiana (Walker 1935). After 1719 the status distinction would have been ameliorated in the immediate vicinity of the La Harpe post, but would have been maintained longer in the Spirit Lake and Boyd Hill archeological localities. European goods would not come to dominate Kadohadacho archeological assemblages until late in the eighteenth century, well after the population decline was in evidence and the population began shifting to the immediate vicinities of the French posts. Such declines might be reflected in the skeletal populations from the period in their demography and pathologies, as well as in a change in the locations of settlements.

Testing and fine tuning a model such as this will require many excavations on a scale equivalent to that undertaken at Cedar Grove, following intensive surveys to find sites of this era. This will take a long time, during which we can expect the attrition on sites to continue through both natural and human agents. Gregory (1973:219) noted some of the problems inherent in the current known data: there is uneven geographic coverage and a strong bias on burial sites to the exclusion of settlements; available collections are mostly unquantified; and many factors needed for dating (such as sherd temper) are not reported. Most tellingly, the site samples are from uneven investigations by a variety of persons with different aims, mostly early archeological investigators, avocationalists, pothunters, and salvage and cultural resource management projects. Problems reported with historic site research over a decade ago (Hally 1971) are still with us. Most professional attention is on identifying the European posts within the Caddoan area, and the work rarely progressed beyond limited testing on any contact era site (see Humphreys and Singleton 1978:77-78 and Gregory 1973 for a bibliography of some of these investigations). The discovery of Cedar Grove and Sentell buried deeply by flood deposits provides some hope that similar sites may yet be found and investigated. For the time being, though, the intensive excavations at Cedar Grove provide an opportunity to place a single site within the overall Great Bend contact era model for the Kadohadacho confederacy, specifically in the Spirit Lake locality.

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Chapter 6

HISTORICAL BACKGROUND

by Beverly Watkins

EARLY EXPLORATION OF THE RED RIVER VALLEY

Europeans first came to the Red River Valley in the late 1600s as the Spanish expanded their missionary work among the Indians of east Texas. The expedition of 1691-1692 led by Don Domingo Teran de los Rios was the third official campaign and was the only one to reach the Red River Valley (Hatcher 1932:32-35). Political problems in Mexico, however, made it impossible for the Spanish to support a mission so far away, and they lost contact with the Caddo.

The French were the first to directly influence life along the Red River. In 1719 Jean-Baptiste Benard de La Harpe established a post on the Red River in what is now northeast Texas. His purpose was to establish trade with the Spanish, but he also began trade with the Indians (Wedel 1978). Other French traders and their families soon followed, some living in a Caddo settlement as early as 1737 and remaining in the area for many years (Sibley 1805:729). Still others were seasonal or transient traders following the pattern of the French-Canadian voyagers, and there is little documentation of their activities.

When the United States purchased Louisiana from France in 1803, American officials had little information about the new territory. The need for accurate information was acute in the Southwest, along the Red River, where the boundaries of Louisiana were to be the same as under the French, but where the division was between the French and the Spanish had always been vague.

Thomas Jefferson, long interested in science and exploration, thought government supported exploring parties would be the best way to get reliable information, and as soon as Lewis and Clark left for the Northwest, he turned his attention to the Red River Valley. Late in 1803, Jefferson requested permission from Congress to send a party up the Red River. Congress agreed, and plans were begun for an expedition to determine the location of the source of the river and to ascertain the boundaries of Louisiana (Flores 1976:1-2; Watkins 1977:13).

Originally planned for the winter of 1804, the expedition had to be postponed because of the opposition of Spanish authorities. In the meantime, the President asked John Sibley, the United States Indian Agent at Natchitoches, to supply detailed information on the river and tribes that lived along it. Sibley, who had never been up the river, based his report on information from Francois Grappe, a Frenchman who had lived and traded on the river for more than 30 years. Sibley described the banks of the Red River above the mouth of the Sulphur Fork (which he called Little River of the left) as a series of canebrakes interrupted by prairies (Figure 6-1). He described Long Prairie as handsome and rich, "bounded by handsome oak and hickory woods, mixed with short leaved pine, interspersed with pleasant streams and fountains of water." He also mentioned Little Prairie (Fisher Prairie at Garland City), an oak and pine bluff (probably Boyd Hill), and a stand of cedars stretching along the river for many miles before

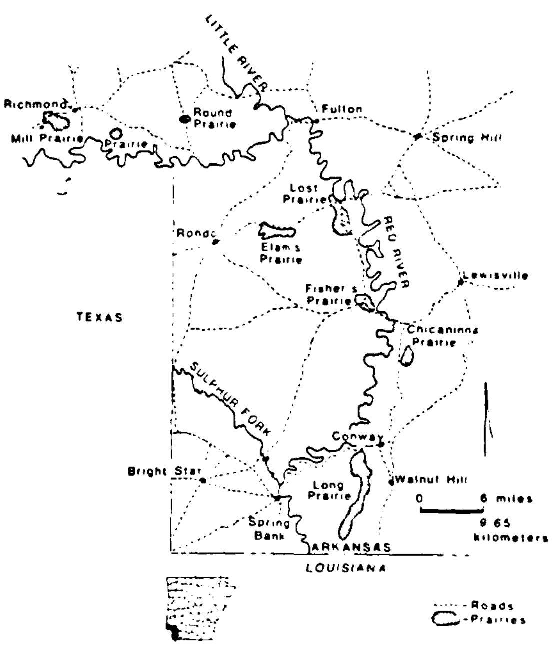

Figure 6-1. Early historic settlements in southwest Arkansas (after Venable 1865)

reaching Little River. The distances Sibley gives are misleading, being roughly twice the actual distances between landmarks, but he was dependent on others for his information (Sibley 1805:728-729).

The Red River expedition began reorganizing in 1805 and finally got underway in June 1806, led by Colonel Thomas Freeman, a surveyor. The party included naturalist Dr. Peter Custis, Captain Richard Sparks, Lieutenant Enoch Humphreys, two noncommissioned officers, 37 soldiers, and a black servant plus guides and interpreters. After a 14-day struggle around the Great Raft, and another 15 days at the Coushatta village, the expedition reached Arkansas on July 13. The party continued up the river for another 16 days, describing the country through which they traveled as a series of canebrakes and prairies. Although they visited the sites of several abandoned Caddo villages (see Wedel 1978), they did not meet anyone living in the area. On July 29, they were confronted by a large force of Spanish soldiers whose commander demanded that the exploring party retreat. Since Freeman had been instructed not to fight a superior force, the expedition withdrew. The return trip to Natchitoches took 25 days (Watkins 1977; Flores 1976).

SULPHUR FORK FACTORY

In 1795 the United States government began operating a system of posts, called factories, for regulating trade with the Indians. As Americans began settling in Louisiana and developing commercial relations with the Indians, a factory was established at Natchitoches to oversee trade and to administer Indian affairs in general. Problems over the location of the factory buildings as well as conflicts with the local merchants made it advisable to move the factory farther up the river.

With this in mind, John Fowler, the factor, made an inspection tour up the Red River in April and May 1817. The location he recommended was on a high bluff on the west bank of the Red River near the mouth of the Sulphur Fork. Fowler chose this site because the Indians were already coming to that area to hunt, and because unscrupulous private traders were operating there. The site also offered the opportunity to trade with Indians who lived too far away to come to Natchitoches, and Fowler mentioned villages of Coushattas, Delawares, Caddos, and Pascagoulas (Magnaghi 1976:288-289).

Fowler received permission to move late in the year, but it was May 1818 before construction was actually begun at the new site. Choosing a location three quarters of a mile (about a kilometer) below the mouth of Sulphur Fork, Fowler left the highest part of the bluff for a military post and built the factory on an adjacent site. Although there were many construction problems, by May 1819 the complex included a two-story combination store and dwelling, a smaller two-story skin and fur house, a cookhouse, and temporary buildings used as a guardhouse and for storage. A ferry was built later to allow the Indians to hunt on the east side of the river (Magnaghi 1978:173-174, 181).

While construction was going on, Fowler began making contacts with the nearby tribes. He visited the chiefs of the Pascagoulas, Alabamas, and Coushattas, presenting them with gifts and inviting them to the factory. Oriley Colton, Fowler's interpreter, visited the Cherokee, and invitations were also sent to the Delaware and Shawnee who had settled on the Red River above the factory. The Caddos posed a special problem because eight of their 10 villages were on Spanish territory and their chief was hostile to the Americans. Fowler was upset by threats made by the Caddo chief, but John Jamison, the Indian Agent at Natchitoches, reassured him that the chief could only raise 500 warriors and that the army could handle them (Magnaghi 1978:174-175).

Congress abolished the factory system in 1822, and substituted agents who would license private traders. George Gray took over the buildings, and the Sulphur Fork Factory became the Red River Indian Agency. Gray stayed at the site until 1825 when he moved his agency downriver to Caddo Prairie to be closer to the Indians. Collin Aldrich, one of the private traders, continued to use the buildings (Carter 1951:47, 117).

EARLY SETTLEMENTS

While the factory was wrestling with the problems of Indian trade, American settlers were beginning to develop the eastern side of the Red River Valley. Fowler reported in 1817 that there were 130 white families settled along the east bank of the river between Sulphur Fork and Saline Creek. He made several trips among these settlements hiring farmers and slaves to help with construction at the factory (Magnaghi 1978:170, 173).

The first settlers were herdsmen who made their living grazing livestock on public lands. They settled first on the natural prairies where the rich grasses and nearby canebrakes made it possible to manage large herds of cattle and swine with a minimum of effort (Owsley 1969:6). Long Prairie, just across the river from the factory, was one of the first areas to be settled. Among the early residents were the Conway family (prominent in Arkansas politics), and Stephen F. Austin who established a farm on Long Prairie as early as 1818 to use as a way station and supply base for his colony in Texas. Austin intended to use his farm to raise cattle to sustain his colony until it became self-sufficient, but the site was unhealthy and that aspect of the project was abandoned (Barker 1926:24-25).

The herdsmen who first settled the prairies were soon displaced by agricultural settlers who bought the rich lands and cleared and fenced them (Owsley 1969:4-7). The importance of the prairies to the developing agriculture in the valley can be seen in the pattern of settlements and the post offices for them. There were enough people at Long Prairie in 1824 to justify a post office; the first post office west of the river was at Lost Prairie in 1828. When Lafayette County was organized in 1827, commissioners decided to establish the courthouse at Chicaninna Prairie about 12 miles (19 km) north of Long Prairie (Arkansas Gazette June 1, 1824, June 4, 1828; Hempstead 1890:934).

THE GREAT RAFT

One of the major impediments to the development of the valley was the Great Raft of the Red River. This was a series of natural rafts and log jams where logs, stumps, and other debris clogged the channel so thoroughly that trees could grow on top of it, and stretches of the river could be traveled on horseback. Beginning north of Natchitoches, the raft was estimated to be 100 to 140 miles (160 to 225 km) long, ending near where Shreveport now is (Arkansas Gazette April 11, 1826; Mills 1978:14-15, 22). It was possible to get around the raft through a series of bayous and lakes that paralleled the river, but these routes were only adequate for the smaller keelboats. As a result, trade with the settlements above the raft was limited.

Early attempts to cut through the smaller portions of the raft were unsuccessful and by 1825 the citizens of Long Prairie were seeking government help. The first government attempt to remove the raft began in 1830 by the Corps of Engineers. The effort was inadequate at best, since the appropriation was for only $25,000. While work was being done on the foot of the raft, the head of the raft was building up the river at a rate of one-half to one mile (1 to 2 km) a year (Arkansas Gazette October 27, 1830).

Enough improvement was made to allow the first steamboat to ascend above the raft in 1831. Leaving Natchitoches the middle of May, the Alps (which was renamed the Enterprise) reached Long Prairie on June 16. Owned by Benjamin R. Milam, it was a small boat of 30-40 tons (27-36 MT) burden and was loaded with provisions for the Army post, Ft. Towson, at the Kiamisha River. The boat stayed at Long Prairie for two days then headed upriver reaching Lost Prairie a few days later (Arkansas Gazette June 22, June 29, July 6, 1831).

The successful trip of the Alps marked the start of regular commerce on the river, but the problems of the raft remained. It was not until 1838 that the river was finally cleared, a task which took Captain Henry Shreve six years to complete, even with a specially built boat and crews of up to 300 men. The job cost $300,000 but Shreve estimated that the value of usable land along the river increased by $15 million because of increased access to trade and because some lands which had been permanently flooded were drained (Mills 1978:21-22).

PLANTATION AGRICULTURE

As the herdsmen were replaced by agricultural settlers, the Red River Valley in Arkansas experienced a period of population growth. Lafayette County, which included both the current Lafayette and Miller counties, grew from 748 in 1830, to 2,200 in 1840, to 5,220 in 1850, to 8,464 in 1860. Hempstead and Sevier counties (which included the present

Little River County) experienced similar gains.

The clearing of the raft made it feasible to establish large slaveholding plantations on the rich lands of the bottoms, since produce could be shipped directly down the river. Because Lafayette County experienced its greatest growth at the height of the westward expansion of the Cotton Kingdom, many of its plantations were owned by land speculators and other outside investors. Some of these absentee owners lived as close as Lewisville, others as far away as Alabama; several lived on the Red River in Louisiana. Overseers were responsible for the day-to-day operation of the plantations and a great deal of attention was given to efficient and "scientific" management (Taylor 1959:90-92; Fogel and Engerman 1974:I:199-203; Taylor 1958:102-107; Genovese 1974:11-21).

Although cotton was the primary commercial crop (1,977 bales in 1850), the plantations grew a wide variety of grains and food crops. The 1850 census listed substantial quantities of rye and oats, corn, Irish and sweet potatoes, peas and beans, and rice being grown in Lafayette County, as well as lesser amounts of wheat, hay, and clover seed. A large number of swine were raised as well as cattle, horses, mules, and sheep. Animals slaughtered in 1850 were valued at $25,555. Other agricultural products included wool, butter and cheese, and beeswax and honey (DeBow 1854:200-205).

The slave population grew as the plantations expanded. In 1830 Hempstead County had the largest number of slaves in the state, and Lafayette County was fifth. By 1860, Hempstead County ranked fifth in number of slaves, and Lafayette County eighth, but Lafayette had slightly more slaves than whites--4,311 out of a total population of 8,464. Statewide in 1860 the average slaveholding was 9.6, while the average number of slaves per owner in Lafayette County was 15.9 (Taylor 1958:26, 52, 56).

Life on the plantations followed the basic patterns established in the cotton growing areas of the Southeast. The fieldhands were organized into workgangs whose tasks changed with the seasons--clearing, plowing, planting, cultivating (chopping), picking, ginning. Other slaves cooked, sewed, tended children, worked as servants, or cared for stock. Not all work was agricultural, and slaves were often hired out to work on roads and levees or to work for the United State government in keeping the Red River clear of rafts (Taylor 1958:82-85, 89, 115). It was customary in northwest Louisiana to allow slaves land for gardens, and many raised vegetables and chickens to supplement their rations (Genovese 1974:535-536). This custom probably prevailed in Arkansas as well.

One way in which plantation life was different in the Red River Valley from that in the older Southern states was in the extent to which the slaves were exposed to religious instruction. By the time Lafayette County was settled, the acrimonious battles over the spiritual needs of slaves had been resolved and teaching slaves the Christian faith was no longer controversial (Genovese 1974:184-188). The Red River Valley in Arkansas, because of its large slave population and the number of absentee owners, became the focus of missionary efforts by both the Baptist and Methodist churches.

The Methodist Church began its organized work among the slaves in the southwest corner of the state when the Arkansas Conference established the Red River African Mission in 1840 or 1841. Membership in the mission varied from 103 in 1845, to 220 in 1850, and ministers were regularly appointed to the post by the conference. These pastors served both the slaves allowed in white churches and those in separate slave congregations.

Baptist work among the slaves was not as organized as the Methodist efforts because of the Baptist tradition of decentralization. Much of the mission work was left to local churches and associations. The Red River Association was one of the most successful in this work--at one time it was supporting four missionaries to the slaves. The Arkansas Baptist Convention, organized in 1848, was concerned that the large number of absentee owners in Lafayette County was reducing the opportunities the slaves had for religious training, and dispatched a missionary to meet the special needs of the slaves (Taylor 1958:172-174, 181-183).

As the plantations expanded, towns developed along the river and on the high ground at the edge of the valley to serve the planters. Conway, Walnut Hill, Richmond, Spring Hill, and Laynesport were all close to the river (Pelham 1848), while Lewisville was established in 1841 in the hills as the new county seat (Hempstead 1890:934). The largest and most important town was Fulton, which grew from an early ferry landing to become the trading center for the valley. In 1844 Fulton had seven merchants, a candy store, three taverns, and a bowling alley, as well as two doctors, two blacksmiths, and a carpenter. A gin and mill and the ferry rounded out the commercial enterprises (Goodspeed 1890:385). Roads from Little Rock, Pine Bluff, and Camden converged at Fulton to cross the Red River before continuing into Texas (Venable 1865).

CIVIL WAR

For most of the Civil War the southwestern corner of Arkansas was far from the scenes of military action. Life went on much as usual, even after the state capital was moved from Little Rock to Washington, Arkansas in 1863, although the population was greatly enlarged by refugees from areas occupied by the Union Army. The plantations stored their cotton that could not be sent to market because Union forces controlled New Orleans and the mouth of the Red River, and concentrated on raising foodstuffs. Things changed, however, when the Red River became the focus of Union strategy in the spring of 1864.

The overall Union strategy was to split the Confederacy. One army captured the Mississippi River; another fought its way into Atlanta. A third moved to capture the Red River Valley and separate Texas from the rest of the South, ending its role as a warehouse for cotton and a supply route from Mexico. This was to be done by having General Frederick Steele march south from Little Rock to join the forces of General Nathaniel P. Banks moving up the river. The fighting never reached southwest Arkansas. Banks was turned back while still south of Shreveport; and Steele turned east, away from Washington, before being forced to retreat to Little Rock because of a shortage of food and forage (Johnson 1958).

Steele's expedition badly frightened the state officials and local citizens. Fighting at the battle of Prairie DeAnn came within 8 miles (13 km) of Washington, and it had been necessary to remove the state government across the Red River to Rondo for safety. The measure of safety was small, however, as no effort had been made to protect the major crossings. Some residents reacted by fleeing into Texas with their slaves. The Confederate Army, fearing another excursion by Steele in the spring of 1865, applied itself to fortifying the river crossings, and built major earthworks at Fulton and Dooley's Ferry (Venable 1865; Magruder 1864a, 1864b; Smith 1865). The earthworks were never tested because the war ended before Steele could launch another campaign.

TENANT FARMING

The post-Civil War period was a time of change and uncertainty all across the South. The hopes and aspirations of the newly freed slaves stood in direct conflict with the views and desires of their former owners. The planters wanted to reestablish a disciplined work force to farm their land (Roark 1977:111-155), while the freedmen wanted to exercise their freedom, restore family ties broken by separations, and acquire some land of their own (Litwack 1979; Gutman 1976; Magdol 1977; Oubre 1978).

The most pressing problem in the Red River Valley of Arkansas, as elsewhere, was the change from slave labor to

wage labor on the plantations. As early as 1862, General Benjamin F. Butler began a system of compensated labor in the portions of Louisiana under federal control. His plan called for contracts between the planters and the laborers for an entire season. The compensation was to include housing, rations, medicine, a garden plot, and wages or a share of the crop. Although physical punishment was forbidden, laborers were required to work or face punishment by the local military authorities. As the area under federal control increased, General Nathaniel Banks, Butler's successor, extended this contract-labor system until it was in use in most of the Mississippi Valley (Roark 1977:114).

This practice continued after 1865 with the contracts being handled through the Freedmen's Bureau. The first contracts were usually with a group of freedmen to work an entire plantation (e.g., Sentell 1865), but this soon proved cumbersome and inefficient. Instead the landowners divided their plantations into "farms" and contracted with one man to work each parcel (e.g., Worley 1954). Although the specifics of these contracts varied, usually those with a group of freedmen provided for wages and included strict rules of work and behavior, while the contracts with individuals promised the laborer a share of whatever crop was grown, typically two-thirds of the corn and three-fourths of the cotton. In both cases the landowner furnished housing, tools, and seed, but in the first instance the laborers were expected to provide their own food and clothing out of their wages, while in the second case the landowner advanced food and clothing against the laborer's share of the crop.

Changes in types of labor contracts brought about changes in the landscape as well as in the work methods. Under the early group contracts the freedmen continued to live grouped together under the supervision of the landowner or his agent. As the land was parceled out to individuals, however, the laborers disbursed as each family established a house on the farm they were working (Coulter 1947:tenth illustration following page 224). Although this gave the laborers some control over their parcel, it still did not meet their desire to own land.

It was widely believed that the Freedmen's Bureau would confiscate the land of former slaveowners and distribute it to former slaves in 40 acre (16.2 ha) lots (Oubre 1978; Litwack 1979:399-407). This distribution of land did not take place, and the freedmen lacked the resources to take advantage of the public lands made available under the Southern Homestead Act of 1866 (Magdol 1977:139-173, 191). The result of these difficulties in obtaining land left the laborers dependent on the landowners, and trapped in the sharecropping system where it was difficult to get out of debt (Rosengarten 1975; Daniel 1973). In Arkansas in 1875 only about 2,000 freedmen owned some type of real property. In 1910 of all the nonwhite farm operators in the state (owners, tenants, or whatever) only 23% were black farm owners (Magdol 1977:212-213). In Lafayette County in 1930, in a population that was 50% black and which had experienced steady growth since 1880, 80% of the farms were operated by tenants (Arkansas State Planning Board 1936:15, 19, 36).

RIVER AND RAILROAD

Neglect of the Red River channel after it was opened by Captain Shreve had allowed the raft to re-form in northern Louisiana above Shreveport. The Corps of Engineers tackled this obstacle again in 1872, and the channel was open once more in 1873 (Mills 1978:52-54). Even so there were continuing problems with obstructions that contributed to the decline of river traffic once the railroads were built.

The coming of the railroads caused significant changes in the Red River Valley. The Cairo and Fulton Railroad (later the Missouri Pacific) completed its bridge over the river at Fulton in March 1874, opening the line to traffic from Texas to St. Louis. The river was bridged again in the early 1880s, this time at Garland, by the Texas and St. Louis Railroad (St. Louis and Southwestern).

The effect was the same everywhere. Because the railroads provided more reliable transportation and shipping than the river, commerce flourished along their routes--construction camps and interchange points became booming cities while older towns died out. In Lafayette County, a town called Galveston, on the railroad one-half mile (just under a kilometer) from Lewisville, soon became known as New Lewisville, and then took the place of Old Lewisville as the county seat (Hempstead 1890:934-935). On the Red River, Fulton lost its importance as a cotton port and was reduced to a minor shipping point on the railroad, while Texarkana, at the junction of three railroads, became the region's commercial center.

FLOODS AND LEVEES

Although trade patterns shifted to the railroads, the Red River continued to dominate life along its bottomlands. The river's high waters, floods, and channel cutting activity were a constant concern to residents and landowners. Even before the Civil War some plantation owners tried to protect their land by raising levees to control the river. These slave-built levees were too low to contain the river and there was little coordination between landowners, so the effort was not effective.

Serious flooding along the Mississippi River in the 1870s, made worse by a piecemeal levee system, led to the formation of the Mississippi River Commission in 1879. Formed to coordinate levee building efforts along the Mississippi River and its tributaries, the commission encouraged the formation of local levee boards to oversee this work, and the Corps of Engineers was authorized to give advice to these local groups. Along the Red River in Arkansas the banks were laced with protective earthworks by 1887 (U.S. Army Corps of Engineers 1892:sheets 1-11).

Lack of coordination between boards, and inconsistency of construction standards made these levees ineffective. Following a record flood in 1892, residents began petitioning for help. The Corps of Engineers was slow to respond, however, because the Corps was limited to building levees to improve navigation, and it felt that the amount of navigation on the river in Arkansas did not justify the expense. The locally sponsored work continued and in 1905 two levee districts were chartered by the state, Red River District No. 1 and Long Prairie District. These governmental units had the power to assess taxes to raise funds for building and maintaining levees and could match funds with the federal government for flood control work (Harrison and Kollmorgen 1947:413-414). Finally in 1925 Congress approved a comprehensive survey of the Red River to determine the best means of flood control (Mills 1978:112-114, 121).

The Red River survey had not been completed when the Mississippi Valley was devastated by the 1927 flood. Sixteen million acres (over six million hectares) were flooded in seven states, including the Red River Valley in Arkansas from the Louisiana line to just above Index (Daniel 1977:85). Water washing through breaks in the levees, called crevasses, created deep pools known as blue holes. Then the water was held by the levee system and it was necessary to dynamite at least one levee in Lafayette County to allow the floodwaters to drain back into the main channel of the river. Homes were lost, farm buildings were destroyed, and so much silt was deposited on the land that it was several years before the land could be farmed (Nutt 1980).

POST-1927

The Red River Valley of Arkansas today is still an area of large scale agriculture. The widespread destruction of

the 1927 flood, the Great Depression of the 1930s, and the mechanization of farming have all contributed to the decline of the tenancy system, at the same time that the promise of good jobs in northern industries lured young people away from rural south Arkansas. The size of landholdings has increased as new methods and machines have given a new dimension to the old plantation system and made only the large farms efficient.

Cotton is no longer the main commercial crop. Many farms now concentrate on soybeans or rice, while others have become cattle ranches. The railroads retain their key roles in shipping while the interstate highway system has reinforced the importance of Texarkana as the regional center of trade and the gateway to Texas that Fulton once expected to be.

HISTORIC DOCUMENTATION OF THE CEDAR GROVE LOCALITY

The land that includes 3LA97 was bought from the U.S. Land Office in 1834 by Thomas M. Barnett of Montgomery, Alabama (Lafayette County Land Entry Record). Barnett had moved from Georgia to Alabama in 1817 where he purchased a large number of acres of unoccupied prairie land which he made into a prosperous plantation (Owsley 1969:24; Robertson 1892:72-73; Weekly Alabama Journal September 26, 1857). There is no indication that Barnett intended to move to Arkansas when he purchased the land in Lafayette County, rather the amount of land he bought (portions of 14 sections) suggests an investment, a common practice (Eaton 1971:390). Barnett apparently selected the lands himself, although a portion of the purchase may have been for friends and neighbors, for in 1839 he deeded part of the property to David Gilmore, also of Montgomery (Lafayette County Deed Record C:374).

By 1850 the Barnett Plantation included 600 improved acres (about 243 ha) worked by 65 slaves. The land was valued at $6000 plus $1200 for tools and implements. Livestock included 3 horses, 9 mules, 16 milk cows, 8 working oxen, 60 other cattle and 200 swine given a total value of $2200. In addition, animals worth $440 were slaughtered during 1850. The small number of work animals suggests that this may have been a stock-raising operation rather than a cotton plantation, especially since its only agricultural product was 5,000 bushels of corn (U.S. Census 1850a: Lafayette County, Roane Township; 1850b:Lafayette County, Roane Township).

In 1851 Barnett turned his attention to his Tallassee Factory, an establishment near Montgomery noted for the manufacture of slave cloth, and he gave power of attorney over his Red River property to his son Nicholas D. Barnett and his son-in-law Benjamin H. Micou. He gave them control of the plantation, slaves, stock, provisions, and all other property to cultivate or sell (Weekly Alabama Journal September 26, 1857; Lafayette County Deed Record F:181).

Within two months Micou, acting as Barnett's agent, sold the plantation to William A. Higgs and James R. McClintock. The transaction included 963 acres (about 387 ha) and 65 slaves plus all "privileges and appurtenances." In order to pay for the property, Higgs and McClintock mortgaged the land and slaves against eight bonds maturing from 1853 to 1860 and totaling $60,000. In addition Higgs and McClintock each took a mortgage on his half interest in the slaves as security for the bonds (Lafayette County Deed Record F:182-190). Early in 1853 Higgs sold his interest in the land and slaves to James B. Gilmer of Bossier Parish, Louisiana. McClintock, who apparently lived on the plantation and ran it for the partnership, acted as Gilmer's agent in the sale (Lafayette County Deed Record F:358). McClintock added adjoining property to the plantation, including the entire sixteenth section which he bought from the school commissioners in 1855 (Lafayette County Deed Record J:392-393; Lafayette County Land Entry Record).

By 1860 the plantation, still known as the Barnett Place, included 1,190 improved acres (about 481 ha) and 1,890 unimproved acres (about 720 ha). The work force had grown to 137 slaves (in 27 houses). This made McClintock's operation well above the average both in acreage and number of slaves (Taylor 1958:56-58). The plantation had livestock worth $8,640 including 16 horses, 36 mules, 2 jacks or jennies, 8 milk cows, 20 working oxen, 28 other cattle, and 140 swine. Production for the year included 2,000 bushels of corn, 426 bales of cotton, and 100 pounds of butter (U.S. Census 1860a:Lafayette County, Roane Township; 1860b:Lafayette County, LaGrange Township).

Gilmer died in 1853, but McClintock ran the plantation as a partnership until 1860 when Gilmer's heirs requested a division of the property. The agreement called for the Barnett Plantation (the original 963 acres—about 387 ha--plus section 16), both real and personal property including the slaves to be divided equally, with the stipulations that 82 bales of cotton from the previous year be sold and the proceeds divided, but that the $600 from hiring out Owen, a slave blacksmith, would go to McClintock. The partnership still had to redeem the final mortgage bond from the Barnett estate and also owed merchants in New Orleans for supplies. In order to assure that these debts would be paid, McClintock and the Gilmer heirs each mortgaged their portion of the land to the other party (Lafayette County Deed Record J:377-382, 394-398). The Gilmer heirs got the property that includes the Cedar Grove site, 3LA97 (Lafayette County Deed Record J:394-396).

In 1862 McClintock sold his portion of the property (744 acres or 301 ha) to Francis W. Armor; and in 1863 the Gilmer heirs sold their portion (755.5 acres or 305 ha) to George W. Sentell and John M. Prather of Bossier Parish, Louisiana for $22,665. The slaves apparently had been moved from the property for there is no mention of them in either deed (Lafayette County Deed Record K:359, 534). Armor settled on his property with 32 slaves of his own; Sentell and Prather stayed in Louisiana but may have worked their land under the supervision of John Sentell, George's brother, a merchant who lived nearby (Lafayette County Real Estate Tax Record 1862, 1865; U.S. Census 1870:Lafayette County, Lagrange Township). In 1869 Prather deeded his interest in the property to G. W. Sentell for $4,750. At that time both men were residents of New Orleans (Lafayette County Deed Record O:75).

Sentell expanded the plantation, eventually buying the Armor property and much more. The Sentell family continued to live in Louisiana, near Plain Dealing, while work on the plantation was done by tenant farmers.

The contract for 1865 between the Sentells and the freedmen on their plantation called for the Sentells to furnish "full and substantial rations, sufficient fuel and quarters, and all needful medicines," and to pay each worker a monthly wage. This wage ranged from $6 to $15 per month depending on the person's ability to work in the fields. In addition each "best male hand" was to be furnished one acre (about half a hectare) of land, probably to use as a garden. For their part the workers agreed to give "good and faithful service," not to be absent during working hours without permission and to work 26 days in every month, "half of every Saturday excepted." The freedmen also agreed to a set of rules: to begin work at sunrise and work 9 to 11 hours depending on the month; to take care of the tools and pay for any lost or broken; to do necessary chores even on Saturday evenings and holidays; to settle disagreements without quarreling; to refrain from thieving or stealing; and to keep no livestock except poultry. The terms of this contract were typical for that time, and 28 workers agreed to its terms, including six couples with 21 children (Sentell 1865; Coulter 1947:76-77). Contracts for wages were soon replaced by sharecropping agreements, with the landowner typically getting a quarter of the cotton crop and a third of the corn crop.

In 1896 following G. W. Sentell's death, his children sold their interests in the property to their mother, Mildred A. Sentell for $28,000 (Lafayette County Deed Record

Y2:220). Then in 1914 after Mildred A. Sentell died, her heirs sold all of the Sentell property in Lafayette County, including that known as the Barnett Plantation to M. D. and Roy Lester (Lafayette County Deed Record Y3:501-502).

According to Betty Nutt of Lewisville, granddaughter of M. D. Lester, the land was used for farming cotton and running cattle. During floods, it was sometimes necessary to bring the cattle into town and following the 1927 flood it was several years before the land could be worked. After M. D. Lester died, the land went to his six surviving children. Members of the family managed the property until 10 or 15 years ago when they began leasing out the land (Nutt 1980). W. H. Triplett owned the property surrounding 3LA97 at the time of the archeological investigation. He leased the land for crops and cattle raising.

THE CEDAR GROVE CHURCH AND COMMUNITY

The nucleus of the black community that formed in the area of the Cedar Grove site, 3LA97, after the Civil War came from F. W. Armor's slaves and the freedmen who contracted to work the Sentell property in 1865 (Lafayette County Will Record B:212-213; Sentell 1865). There is no obvious tie to the slaves that Higgs and McClintock purchased from Barnett, suggesting that these slaves were probably moved from the property before it was sold to Armor and Sentell (Lafayette County Deed Record F:185, 358-359). In 1870 the population of LaGrange Township, which included the Cedar Grove community, was 2,784—1,936 black (70%) and 848 white (30%) (U.S. Census 1870:Lafayette County). By 1900 the population of the area, now in Steele Township (a portion of the earlier LaGrange Township), had grown to 854—741 black (87%) and 113 white (13%) (U.S. Census 1900; Lafayette County).

The Cedar Grove Baptist Church was, and is, an important part of the community. Established in 1881 by Cage Bryant, who was the congregation's first pastor, the original church was a log building at 3LA97 (Foster 1980; Sasser 1980). This is probably the "residence" shown at that location on an 1887 map (see Figure 6-2; U.S. Army Corps of Engineers 1892:sheet 6). According to Emma Davis, a member of the church, this building burned in 1924 (Davis 1980). It was probably at this time that the church was moved to its present site, because a map of the Lester property drawn in 1925 (Figure 6-3) does not show the church (Christian 1925). The church suffered a second fire in 1931, which destroyed all of its records, and the present building was constructed in 1933 (Cullins 1980; Sasser 1980).

Social life in the community centered around the church and, in the early part of this century, around a lodge called the Royal Circle. The organization of groups which provided burial insurance as well as fraternal associations was a common practice in black society of this period. These lodges gave the black community a measure of independence and stability at a time when segregation had been legalized and racially motivated violence was high.

The Supreme Royal Circle of Friends of the World was a fraternal and benevolent society organized at Helena, Arkansas in 1909 by Dr. R. A. Williams. By 1918 it had 25,000 members in five states and was especially strong in the Red River Valley, possibly because W. T. Daniels, the Supreme Secretary, lived in Texarkana (Work 1919:460). According to church members who remember the Royal

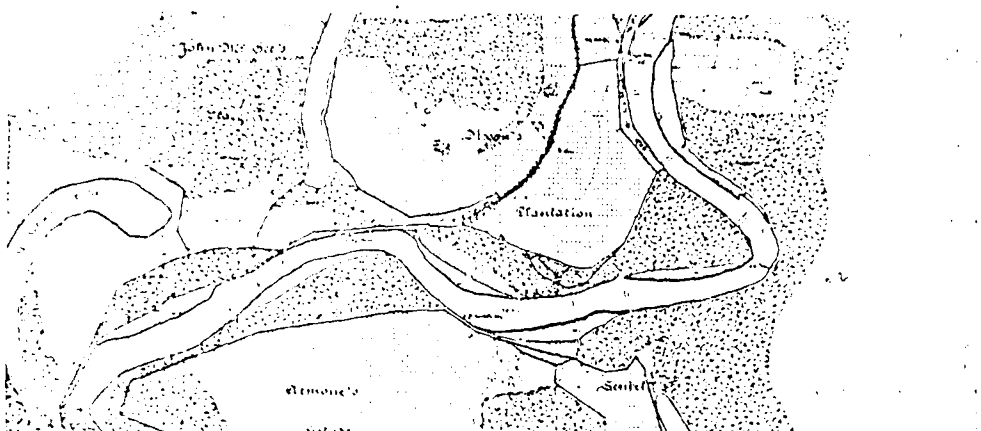

Figure 6-2. The Cedar Grove vicinity in 1887 (from U.S. Army Corps of Engineers 1892)

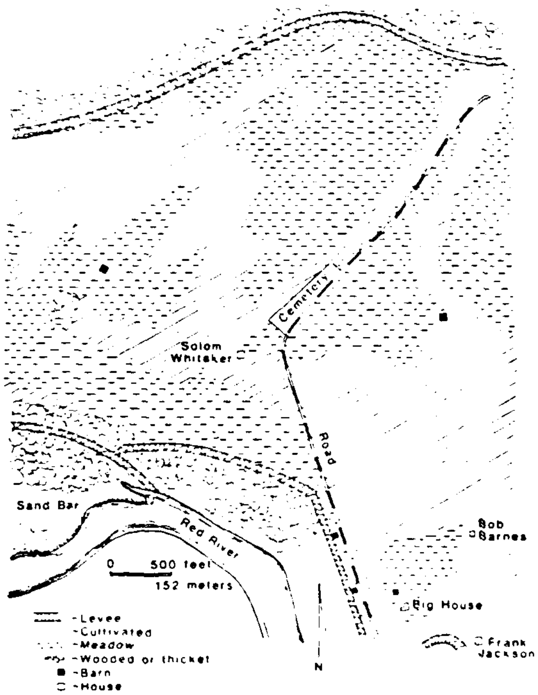

Figure 6-3. **Lester Brothers property surrounding the Cedar Grove Cemetery in 1925 (after Christian 1925)**

Circle, it cost $5 to join and then the dues were $1 every two months. The Circle had separate organizations for men, women, and children which had meetings and socials, and the children got special buttons to wear. As a benevolent society, the Circle paid hospital bills and burial expenses (McGlothin 1980; Foster 1980; Davis 1980).

There was also a school in the Cedar Grove community. The date it was begun is not known, but by 1908 according to Johnny Foster the school was held in the church and met three months in summer and three months in winter (Foster 1980). By 1931 the Cedar Grove School was part of the Lewisville District, serving 66 children in grades 1-6 during an 80-day winter term. It is not clear whether there was a separate school building or whether the school still met in the church. By 1948 the school had its own building next to the church and served 80 children in grades 1-8 during a 160-day term (Lafayette County Supervisor of Schools 1931, 1948).

THE CEMETERY AT CEDAR GROVE

The cemetery was on the west side of a wagon road and may have been fenced to keep livestock out. There is conflicting information regarding a cemetery fence. Peter Cullins remembered that there had been a fence to keep cattle out. Johnny Foster remembered a field fence, but not one for the cemetery; his sister's grave had a wire fence, but it was the only one there. Thus it is possible that the cemetery was separated from the surrounding fields on its north, west, and south sides by a cattle fence, but was open to the road on the east. Individual grave fences, such as the one Foster remembered, were often used in turn-of-the-century graveyards, although they were usually made of cast iron. The 1925 map shows it to be 600 to 650 feet (182-200 m) along the road and from 50-100 feet (15-30 m) wide (Christian 1925; see Figure 6-3).

It is not possible to determine when the first person was buried in the cemetery at 3LA97. The church records were lost in the fires and even the oldest church members do not know whether the cemetery was there before the church was built, or whether the cemetery was started after the church was established. Given the number of graves—111-113 in the direct impact zone, 13 in the test area south of the construction road (see Chapter 7), plus an unknown number under the road and to the south and west of the tested areas—several factors suggest that the cemetery was established before the Civil War, possibly as early as the late 1830s.

Certainly slaves died on the Barnett Plantation and were buried somewhere on the property. A cemetery would not have been located on prime agricultural land, and this one is on the river side of an early levee. Many slaves insisted that graves be oriented east-west (as these are) with the head to the west so the deceased would not need to turn around "when Gabriel blows his trumpet in the eastern sunrise" (Genovese 1974:198). It would naturally follow that the freedmen's community would build its church at an established cemetery and would continue to bury there because the land was already set aside for that purpose, and/or because they had relatives buried there. It can, of course, be argued that Sentell allowed the community to build its church at this site and that the cemetery grew alongside the church. But by 1887 this location was in the center of a large field, prime land well inside the levee, and not land that could be easily taken out of production (U.S. Army Corps of Engineers 1892:Sheet 6).

Speculative statistics also support an early date for the cemetery. If there are 200 graves in the cemetery (a conservative estimate since there are up to 126 known graves and a large area of the cemetery has not been investigated) and if the cemetery was in use from 1834, when the Barnett Plantation was established, until 1927, when it was covered by silt from the flood, then the average number of burials per year was 2.2. In 1850 the annual mortality rate for slaves in Arkansas was 1.8 per 100 (Taylor 1958:158); in 1900 the rate for blacks nationwide was 2.5 per 100, dropping to 1.6 per 100 in 1930 (U.S. Census 1971:55). The slave population on the Barnett Plantation grew from 65 in 1850 to 137 in 1860; there were about 80 freedmen on the Armor and Sentell places in 1865; no exact figures are available for later dates, but judging by the school population, the community was probably stable at 100-125 people. This would put the burial rate in line with the mortality rates. On the other hand, if there are 200 graves and the cemetery was started at the same time as the church (1881) the burial rate would 4.3 per year, well above the mortality rate for a population of this size.

THE PEOPLE AT CEDAR GROVE

Because of the number of unmarked graves in the cemetery an effort has been made to compile a list of the persons known to be buried there. Peter Cullins, a deacon and the eldest member of the Cedar Grove Church, and other church members including Johnny Foster, Sophie McGlothin, and Emma Davis provided a list of names of the people they know to be buried there. These names were then checked in census and other records to determine birth dates and family associations. The list includes 37 people buried at Cedar Grove; because of the ages of the informants, it is unlikely any of these died before about 1910. Still, of the 37 people on the list 16 were born before 1865 and therefore began life as slaves. In the list, which follows, all information is from the 1900 census (Lafayette County, Steele Township) unless otherwise indicated (*s mark those in the cemetery).

*Felix Brown: born October 1868 in Arkansas; both parents also born in Arkansas. In 1893 married Rachel, who

was born in Arkansas in 1870 also of Arkansas parents; their children include Carrie (1894), Edna (1897), and Singuin (1899).

•Cage Bryant: born July 1848 in either North Carolina (U.S. Census 1870) or Virginia, both parents born in Virginia. Listed in F. W. Armor's will (Lafayette County Will Record B:212-213). First wife Celia born in Kentucky in 1845, their children: Jonas (1868) and Creasy (1870) (U.S. Census 1870). Married a second time in 1888 to Mary, born in Arkansas in 1865; her father was born in Arkansas and her mother in Virginia; their children: Bettie (1892), John (1895), Louisa (1897), Modicue (1899). Also two other children, probably by Celia: Amilie (1884) and Buzzy (1887). Bryant was the first minister of the Cedar Grove Church and cut the logs for the church building (Cullins 1980).

•William S. Campbell: born October 1854 in Louisiana; both parents were born in Alabama. In 1886 married •Sarah, who was born in Arkansas in 1865; their children include Ella (1889), Thomas (1890), Rosa (1893), Annie (1895), and Robert (1899).

•George Clark: born December 1849 in Arkansas; both parents also born in Arkansas. In 1880 married •Little (Liddie), who was born in 1847 in Mississippi whose father was from Georgia and whose mother was from Alabama. They had seven children, but by 1900 all of the children had left home.

•King Clark: born December 1865 in Arkansas; both parents also from Arkansas. In 1890 married •Queen, who was born in Arkansas in 1872 to Arkansas parents. Their children include Susie (1890), Bertha (1892), Moses (1895).

•Torrance Clark: born November 1875 in Arkansas; both parents also from Arkansas. In 1896 married Mary, who was born in Arkansas in 1865 to Arkansas parents. In 1900 two stepchildren lived with them: Joshua Lawless (1889), and Lettie Richardson (1892).

•George Collins Sr.: born January 1857 in Arkansas; both parents also from Arkansas. In 1877 married •Amanda, who was born in Texas in 1861. Their children include Dorcas (18[illegible]), Rose (1882), Ella (1884), Ma[illegible] (1886), Mattie (18[illegible]), George (18[illegible]), Lonnie (18[illegible]), McKinley (1896), and [illegible] (1899).

•Alex Conner: born in Louisiana in January 18[illegible]; both parents also born in Louisiana. In 1885 married Lou, who was born in Louisiana in 1865 to Louisiana parents. Their children include Paralle (1886), •Della (1888), Joseph (18[illegible]), and Willie (1894). The footstone found with the Conner name (Figure 6-4) probably was from the grave of Alex.

•Walter Conway: born [illegible] 1872 in Arkansas; both parents from Arkansas. In 1892 married •Lela, who was born in Arkansas in 1876 to Arkansas parents. Their children include Sam (1893), Tarsus (1896), and an unnamed infant (1899).

•Mitchell Foster: born March 1868 in Arkansas, the son of Henry Foster (born 1840 in Mississippi) and Fanny (born 1840 in Virginia) (U.S. Census 1870); died just before the 1927 flood (Foster 1980). In 1883 married Adeline, born 1863 in Arkansas and probably listed in Armor's will (Lafayette County Will Record B:212-213). Their children include Josephine (1887) and Lula (1889). Married a second time to •Mamie Reece, daughter of Peter and Calvena Reece. Children include Johnny (1903) and a •daughter whose nickname was Little Bit (Foster 1980). Mamie Foster died in 1915 (Foster 1980).

•Horace Jackson: born June 1865 in Arkansas; both parents born in Virginia, son of Mary, born 1833 (Lafayette County Will Record B:212-213). Had a son Frank (1887) by

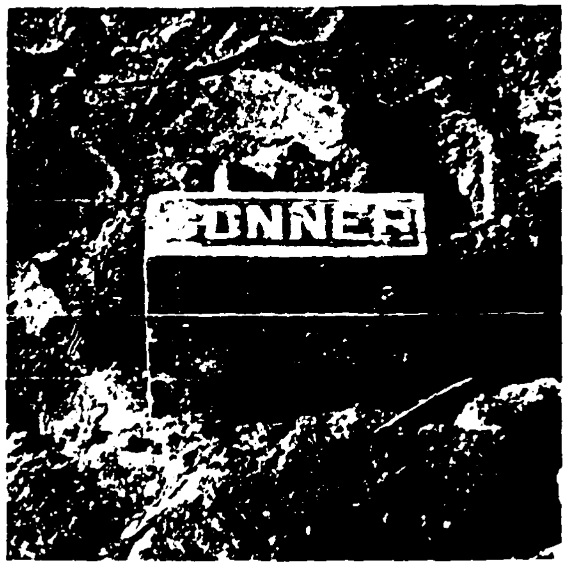

Figure 6-4. In situ footstone after stripping direct impact zone, October 1980 (AAS negative number 807585)

his first wife; married a second time to •Mollie, born in 1866 in Louisiana of parents also born in Louisiana. Jackson died September 1, 1918 and had a Royal Circle headstone which was recovered after it had fallen into the river due to erosion (Figure 6-5).

•Travis Lewis: born in Texas in 1859; both parents from Mississippi. In 1885 married •Nancy, who was born in Arkansas in 1865, whose father was born in North Carolina and whose mother was born in Mississippi. Their children include Travis (188[illegible]), Eliza (1884), Queen E. (1890), [illegible] (1892), Betsy and Cornelia (1894), Arma and Josephia (18[illegible]), Isaac (1897), and an unnamed infant (1899). In 1900 Lewis owned his own farm, although it was mortgaged (Lafayette County Real Estate Tax Records 1900).

Moses McGee: born in Louisiana in June 1855; his mother was born in Mississippi. In 1888 he married Viola, who was born in Arkansas in 1870 to Arkansas parents. In 1900 they had no children.

•Antony Mitchell: born March 1853 in Mississippi; both parents also born in Mississippi. In 1878 married •Catherine, born in 1850 in Louisiana of parents also born in Louisiana. Their children include: Mack (1882), Colonius (1884), Torrey (1886), Maude (1888), Carrie (1889), Kizer (1893), and Ninette (1895). Married a second time to •Mary who died November 23, 1925 and had a Royal Circle headstone which was recovered in the June 1980 testing (Figure 6-6).

•Lue Powell: a recovered tombstone dated September 4, 1919 gives her age as 64 (Figure 6-7) which would be a birthdate of 1855. No listing was found in the census for a person of that name with that birthdate. The closest listing was for a Louisa Powell, born January 1848 in Arkansas. All of the informants agree, however, that Lue Powell was the mother of Grammous (1875) and that her •husband was also buried at Cedar Grove.

•Peter Reece: born January 1850 in Alabama, both parents also born in Alabama. In 1870 lived in the Joseph

Figure 6-5. Relocated tombstone of H. J. Jackson (AAS negative number 808223)

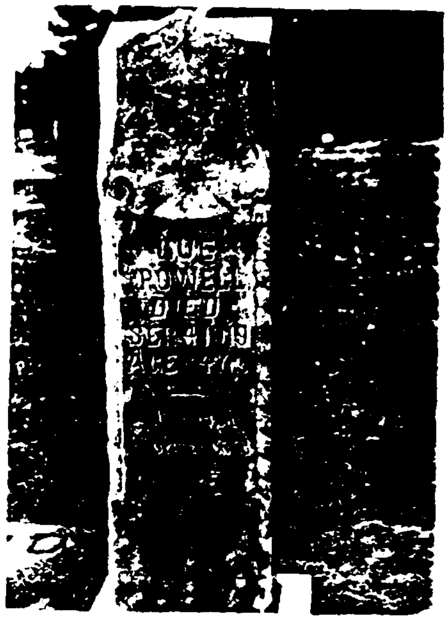

Figure 6-7. Relocated tombstone of Lue Powell (AAS negative number 808216)

Figure 6-6. Relocated tombstone of Mary Mitchell (AAS negative number 808222)

Figure 6-8. Relocated tombstone of Jeff Davis Richards (AAS negative number 808221)

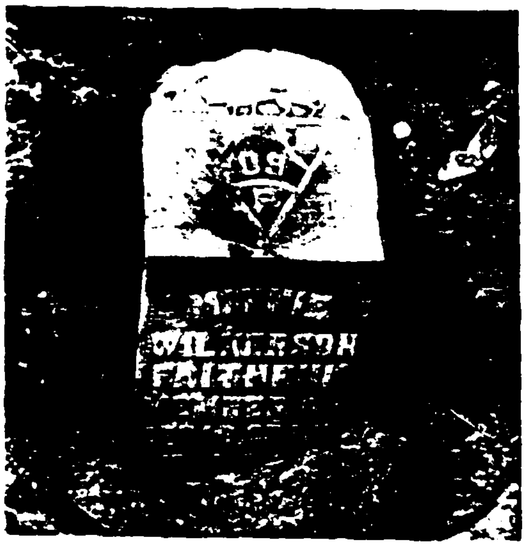

Figure 6-9. In situ tombstone of Minnie Wilkerson, after initial site discovery, June 1980 (AAS negative number 803845)

Ferndon household along with Metta Reece (17) and Diana Reece (14), probably his sisters (U.S. Census 1870). In 1871 married *Calvena, born in Arkansas in 1852; their children: *Peter J. (1882), *Mamie (1884), John (1886), Willie (1888), Alice (1890), Man (1892), and Dock (1896). In 1900 Reece was one of the few blacks to own his own farm (Lafayette County Real Estate Tax Records 1900). Peter and Calvena Reece were Johnny Foster's grandparents (Foster 1980; Cullins 1980).

*Jeff Davis Richards: born December 1863 in Arkansas; son of David Richards (born January 1842 in Missouri) and Lottie Richards (born 1840 in Indian Territory). The family is listed on the contract between Senteil and the freedmen (Senteil 1865). In 1885 Richards married Ella, who was born in Arkansas in 1866 to Arkansas parents; their children include Mary (1885), *Sy (1886), John (1892), Willie (1893), and Conder (1898). The recovered Royal Circle tombstone dated May 24, 1917 and labeled J. B. Richard (Figure 6-8) probably belongs to Jeff Davis Richards, because none of the informants remembered anyone with the initials J. B. *William, Jeff Richards' brother, was also buried at Cedar Grove (Cullins 1980).

*Allen Wilkerson: born March 1872 in Arkansas; son of Allen Wilkerson born in Georgia in 1822 (U.S. Census 1870). In 1892 married *Siely, who was born in Arkansas in 1875 to Arkansas parents, their children include: Lettie (1892), and *Minnie, who died in 1915 and had a Royal Circle headstone (Cullins 1980) which was recovered during the original site investigations 1980 (Figure 6-9).

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Chapter 7

RESEARCH ORGANIZATION AND PROCEDURES

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FIELD HEADQUARTERS

As adequate housing could not be found for a large crew in the immediate vicinity of the Cedar Grove site (Garland City, Lewisville, and Stamps, Arkansas, had no motels or rental housing available), the choice for a field headquarters was between Texarkana and Magnolia, which were about equal distant from the site or about a 45 to 60 minute one-way drive. Although the smaller of the two, Magnolia was selected because of the presence there of the Survey research station under the direction of Frank Schambach at Southern Arkansas University. By staying in Magnolia the project was able to rent empty dormitory space on the campus which was converted into a project field laboratory. Interaction with Schambach for his advice and expertise on local archeology, as well as loan of miscellaneous equipment from his station stores greatly benefited the overall operation of the project.

Motel space was available in Magnolia from operators who were not adverse to having guests who tracked in dirt, as construction teams and oil exploration parties frequently seek housing there. Staying at Magnolia, however, meant that the crew left at 7 a.m. each morning to reach the site and begin work by 8 a.m. Cleanup began at 4 p.m. each day and the crew was generally on the way back to Magnolia by 5 p.m. A half hour was allotted each day for lunch, generally beginning at noon.

Since a great deal of equipment was utilized in the excavations, it was necessary to establish an on-site building for storage. A single room prefabricated metal building was rented and placed on the far southeast corner of the direct impact zone, out of the way of the excavations. Although it had been hoped to set this building in the indirect impact zone, the ground was too low and soft there, or otherwise inconvenient to the excavations.

This building also provided office space for working up field notes out of the wind and rain, and a residence for the staff members who were left on guard duty. As such it was appropriately outfitted with portable tables and chairs, cots, lights and heaters. It was powered by an outside generator and serviced by a port-a-john. During cold weather the crew could warm their hands inside the building and wetscreens full of debris could be left there to dry overnight.

Staff Organization

The field crew was hierarchically organized under the direction of project archeologist Neal Trubowitz. John Miller, the assistant project archeologist was next in field authority, followed by the lab supervisor (Teresa Hoffman) and the four crew chiefs (Randall Guendling, Michael Swanda, Jeffrey Otinger, and Ross Dinwiddie) who were of equal rank. The crew chiefs generally had several paid field assistants, occasionally augmented by volunteers working under them, while the laboratory maintained one full-time assistant, later augmented by another paid assistant for two weeks and volunteer workers. Although an attempt was made to organize some stable crews under each crew chief, the necessities of dealing with different excavation problems as they arose, or in rotating the crew occasionally to more evenly distribute the different kinds of labor, meant that the field assistants were shifted as needed among the crew chiefs.

The staff was divided so that one overall supervisor was always present on the site, aided by at least two crew chiefs and their assistants, every day that weather conditions permitted operations to proceed. This arrangement maintained the recordkeeping capabilities of the project and adequate personnel to continue both excavations and water processing of the dirt. One crew chief, generally Otinger, was responsible for the maintenance and operations at the water processing station while the others supervised the immediate excavations and transportation of the excavated soil to the water processing station.

Supervisors were responsible for all written records on the project, although the writing of some inventories and notes on feature excavations could be delegated to the crew members who were doing such work. Each supervisor maintained a daily field notebook of the general operations under his perusal, plus the appropriate field specimen catalog, collection processing, photographic, and other project data forms. Besides his regular notebook, John Miller kept a hardcover transit book in which he made overall site mapping notations, which were done under his direction.

Fifteen persons (see acknowledgments) participated as paid field assistants during the Cedar Grove project for varying amounts of time. The maximum number of assistants on the site on any one day was an even dozen. Heavy equipment operators (see acknowledgments) were hired to operate their own backhoes and bulldozers.

In addition to the regular staff 41 other persons (see acknowledgments) volunteered assistance in the Cedar Grove project for over 500 hours in the field and hundreds of hours in the laboratory. Most of these people were members of the Arkansas Archeological Society and/or the Louisiana Archaeological Society who had learned of our research through a call for volunteers put out by Frank Schambach. Many had previous excavation experience in the Arkansas Archeological Society's amateur certification program, while others, such as a class of specially talented students from Norphlett Elementary School, had never seen an archeological site.

Together they provided valuable assistance to the project and made it a real exercise in public archeology by their involvement. Volunteers were put to work on tasks appropriate to their expertise under crew chief supervision, working with the regular staff. The volunteers collectively participated in most facets of the excavation, from pushing wheelbarrows and waterscreening, to burial excavations. Assistance in the laboratory included cleaning and sorting of artifacts and the reassembly of whole pots from the interments.

Records and Collections

As already noted, the supervisors maintained a variety of records besides their field notebooks. These other records (see Appendix XI for examples) were all 8 1/2 x 11 inch looseleaf format except the various floor plan and profile drawings and overall site maps, which were done on graph paper of different sizes.

Summaries of field notes were made on a form entitled "daily work record" which provides an overall picture of all activities going on each day of field investigation at the site. The crew chiefs filled out these forms from their notes and project archeologist Trubowitz reviewed them and added information as necessary. With one exception, all written records were reviewed by Trubowitz to insure that they contained consistent information and to add any data that may have been omitted. The exception was the "excavation data forms" which, as noted below, were not completed due to time pressure and redundancy with other records.

On a site as large as Cedar Grove where multiple excavations are in progress simultaneously it is necessary to have a flexible provenience system. The key to the record of the Cedar Grove excavations was the "field specimen catalog" which for each number assigned provides a list of the feature or area, horizontal location and/or grid square number, vertical location or stratum, specimen description and remarks, date collected, and the recorder. Each supervisor carried these forms and assigned numbers as needed to the different proiveniences he worked with. An overall checklist of serial catalog numbers was maintained, so that each supervisor could sign out blocks of numbers to use, avoiding problems of duplication. A carbon copy of these catalog sheets was submitted to the field laboratory when the artifacts were turned in at the end of each day.

The accession number for the data recovery at Cedar Grove was 80-1209. Cedar Grove artifacts recovered before the site mitigation have accession numbers 80-593, 80-622, and 80-1108 (test excavations). Aboriginal artifacts recovered during subsequent removal of the historic cemetery are accession number 82-1009. Catalog numbers for the site mitigation run between 80-1209-1 and 80-1209-1562. There are some gaps where numbers were not assigned in this sequence, and many numbers were assigned as "control" identifications for various proveniences.

These controls were assigned in order that the data could be computerized for analysis. With a control number all associated proveniences could be referenced and retrieved by computer. An "excavation data form" was to be filled out for each field serial number (FSN) that was assigned. The FSN is synonymous with the catalog number. The excavation data form provided a consistent means of recording what provenience a FSN referred to (which duplicates the information on the field specimen catalog) and in addition what other proveniences or artifacts this FSN was associated with. This form was designed to be filled out in the field, with the data being readily formatted for keypunching if that method of data manipulation was utilized. This basic system had been used previously on large scale excavations under the direction of Christopher Peebles at Lubbub Creek, Alabama (Peebles 1981).

Cedar Grove was the first time the Survey utilized such a data form, and as such some of the "bugs" inherent in any new method of recording were not worked out until after the project was over. Initially the supervisors at Cedar Grove were assigning numbers so rapidly to different proveniences that although the field specimen catalog could be kept accurately and up-to-date, everyone soon fell well behind in working up the FSN excavation data form. As all information on this form was recorded by various other means, completion of these computer forms was abandoned near the end of the project and no attempt was made to complete those computer forms that had already been started. The excavation data forms now provide a backup to other records. However, the Cedar Grove experience with these forms permitted their incorporation in more recent Survey research, such as on the Conway Water Supply mitigation (Santeford et al. 1983), Alexander site mitigation (Hemmings 1983) and Toltec site excavation.

One "artifact" of these computer forms, was that all excavation units that were tied into the site grid system were referenced by the coordinates of the northwest corner of the excavation unit which was treated as the unit datum. Each excavation unit larger than 50 cm square, whether it was a backhoe trench, a 3 m square in the grid system, or another sized unit placed to follow out a specific feature, had an "excavation unit summary" form filled out which recorded the unit, excavators, kinds of features recorded, if any, summarized the data collected, gave strategy, field conditions, and interpretations, plus a standardized key for excavation illustrations. All relevant FSN numbers for each provenience were listed on these forms in lieu of the computerization of the field data on the excavation data form.

To keep up with the large quantities of earth being moved from the excavations to the water screening station a "collection processing form" was maintained by both the excavation and water station supervisors. The collection processing inventory provided information on how each FSN was treated after excavation (whether it was screened, flotated, or neither), and the number of standardized wheelbarrow, bucket or bag loads, resulting in what number of packaged bags or boxes of processed material. Carbon copies were sent into the field laboratory, where the staff could then insure that all material had arrived in the lab, and that all loads sent for processing had been run through the appropriate screen size.

Various feature records were utilized to record miscellaneous pits, postmolds, and human interments, both historic and aboriginal. A separate feature list was kept for each of the four categories just mentioned. New feature, postmold, or burial numbers were assigned as the features were recorded in the field, or as features were designated on the basis of later analysis of records and collections. Descriptive information was recorded on other feature records, which summarized the FSN collections associated with each feature. Floor plans and profiles were drawn as appropriate on graph paper. The locations of in situ artifacts and Munsell soil colors were noted directly on the drawings. Although it had been hoped to do all such drawings to a consistent scale, stocks of graph paper varied and a variety of scales were utilized. This applied to overall site mapping as well.

Besides the normal feature records kept, a special "skeletal record" form was kept on each aboriginal interment that was encountered. These forms were designed by Jerome Rose, bioarcheological consultant for the Cedar Grove research, to provide the basic descriptive information and an inventory of the skeletal parts; this provided him with the information he required for his analysis. Descriptions of the burials were written by at least one member of the excavating crew on each burial, and often multiple observations by different crew members were recorded for these features.

Specialized "radiocarbon sample data record" forms were also filled out for those chronometric samples at the laboratory to accompany those samples when they were sent for dating.

Other forms used in minor amounts included a "shovel test record" (which lists test numbers and presence or absence of cultural material in the various soil zones encountered), and numerical checklists for keeping inventories of different numbered subjects.

The Survey's standard photographic record sheet was employed, which records the exposure number, date of the photograph, direction taken, description, roll number, camera type, and film type, photographer, and the negative number assigned for filing. Both black and white plus-X 35 mm photographs and Ektachrome 200 color slides were taken of every major record photograph (not including some of the general illustrations of the crew at work). Two exposures were made of each color slide so that duplicate photographs could be filed at the State Archeologist's Registrar Office

(in Fayetteville), and the Survey station at Magnolia.

After completion of the analyses, copies of all notes and records will be filed at the Registrar's Office with copies also going to the Southern Arkansas University station. All artifacts, soil samples, and other excavated data will eventually be curated at the SAU station for permanent storage and study access except the human remains, which will be curated at the Human Biology Laboratory at the University of Arkansas at Fayetteville.

FIELD METHODOLOGY

The techniques utilized to recover the data buried at Cedar Grove were, of course, closely tied to the data recovery research goals and the site condition. Sampling of the full variety of available data was sought. Modifications in the field techniques were made as the excavation picture changed with each day of work. Although almost all techniques that had been projected in the research design were utilized, the order of operations was adjusted as necessary; flexibility in data recovery is a key element in any excavation.

The following descriptions of the field research are arranged by different tasks or techniques, but the excavations proceeded with many overlapping investigations. The actual progress of the excavations is shown in Figure 7-1. In general order, the site grid was established, and then the overburden was removed. Shovel tests, backhoe trenches, and hand excavation units were employed to further define the geomorphology and settlement arrangement of the direct impact zone. Column samples were then used to collect midden samples across the direct impact zone, and definition of archeological features in floor plan began. Following a four day rain period these "site definition" activities were continued until November 21, when stripping of the midden with heavy machinery was begun to search for settlement pattern features. While the heavy equipment was present the indirect impact zone excavation areas were also opened up to the level of the archeological deposits for later work. Following another bad weather spell over the Thanksgiving holiday, final discovery of features, their excavation, and mapping were undertaken in the direct impact zone. Only after the bulk of this work had been completed in the direct impact zone were excavations started in the indirect impact zone. There settlement pattern and feature excavations were undertaken until the end of the field season. The site was closed down on December 23, ready for backfilling with iron rebar stakes sunk in the ground at S138 E140 and S141 E130 and at the northwest and northeast corners of the 3 m square dug in the Caddo III component (E-W Trench 3, Section 3.) The indirect impact zone excavations were refilled on December 26, leaving the indirect impact zone delimited and marked for historic grave removal.

Site Condition

When the supervisory staff arrived at Cedar Grove on October 23, 1980 the site was the same as it had been left following the test excavations the previous June (Figure 7-2). The excavations in the indirect impact zone south of the revetment road had been filled in, as had Test Unit 1 in the direct impact zone. All other excavation units in the direct impact zone, both hand and machine dug, had been left open to provide future guides for the stripping of the flood deposit overburden.

Test Units 2 and 5 had encountered historic grave shafts which had since been removed for reburial, along with the few marked graves encountered in June (a maximum of six individuals) by Red River Levee Board #1 and the Cedar Grove Church. The backhoe pits left from those grave relocations were still open, providing additional windows on the depth of the buried midden.

The direct impact zone was overgrown with large weeds, including wild gourds and goosefoot (Chenopodium sp.) which had flourished in the backdirt of the excavation trenches (Figure 7-3). The walls and floors of the east-west trenches were generally free of this overgrowth, but the north-south trenches which drained towards the Red River were largely choked with vegetation, as was the ground surface in the areas where no work had been done other than the clearing of vegetation during construction. The indirect impact zone was under cultivation in winter wheat.

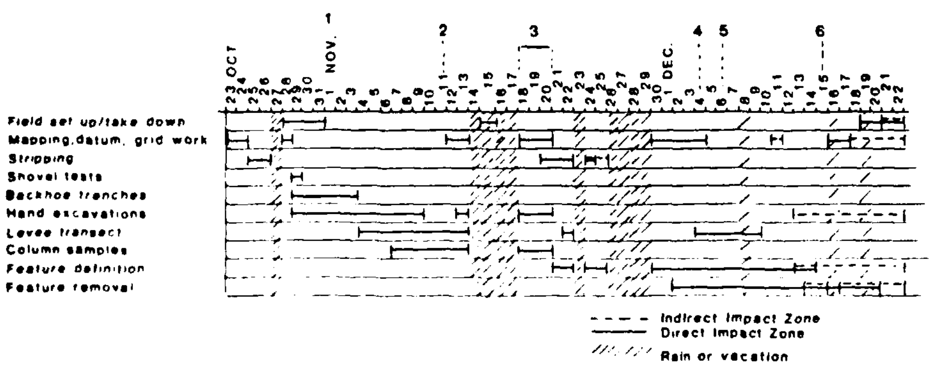

Figure 7-1. 3LA97 data recovery calendar, October 23, 1980 to December 22, 1980. 1. waterscreen operation begins; 2. aerial photography; 3. soil peels laid; 4. first metal detector survey; 5. probing begins; 6. second metal detector survey.

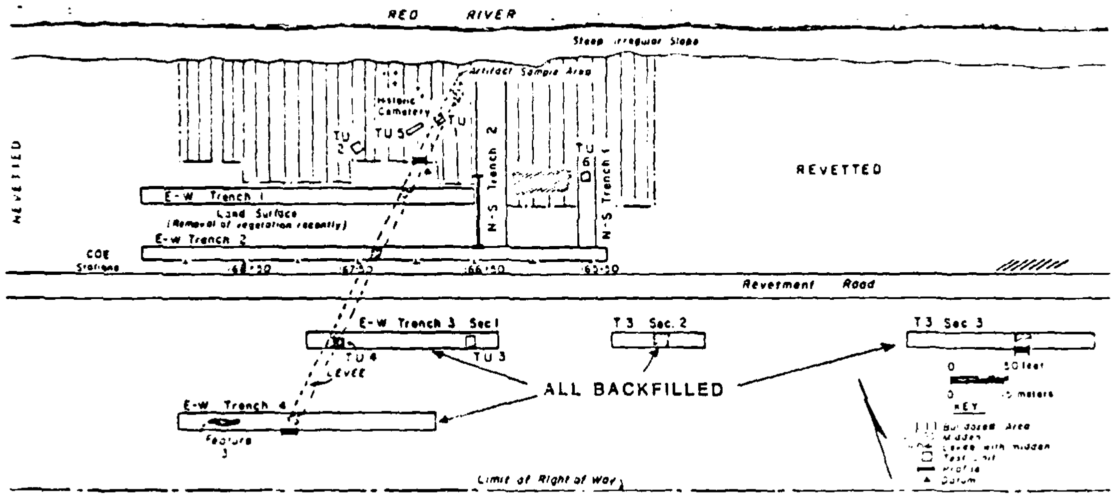

Figure 7-2. 3LA97 site plan after June, 1980 testing

Figure 7-3. Site condition before excavation in October, 1980. Looking east, showing overgrowth and removed historic burial pits (AAS negative number 807571)

Limitations on the Excavations

Excavations at 3LA97 were projected at 50 working days of investigations. The last regular work connected with the excavation was completed on December 22, 1980. During this period rain and/or sleet made it impossible to work on nine days (October 27, November 14-17, November 23, November 26-29) and rain fell without completely halting work on three other days (December 8, 16, and 19). Towards the end of December the weather became very cold, making it difficult to work efficiently, particularly with mapping and photographic equipment. Some time was lost to staff illness resulting from the inclement weather.

Temporary shelters had to be made out of driftwood, wheelbarrows, and plastic sheeting to excavate many of the features. Even with such precautions, the overnight weather was sometimes severe enough to affect the excavation progress. The night of December 8, for example, heavy rains brought flooding and silting in of the features that had been opened up the day before. Those excavations had to be redone the next day. Rainfall also ruined some of the sediment peels made of trench wall profiles.

Because of the rapid gear up for the excavations, some of the equipment was not on hand during the project's first few days. The pump used in the waterscreening operations did not arrive from the manufacturer on schedule, and as a result the waterscreening did not begin until November 1. In spite of these problems 50 actual working days were spent on the site between October 23 and December 22, including the four days of supervisory work before arrival at field headquarters of most of the field crew on October 27.

As pothunters operate extensively in southwest Arkansas out of Texarkana it was considered necessary from the beginning of the excavations to maintain an overnight guard at the site to protect the excavations and the equipment. Pairs of the staff assisted by crew chief Otinger's Malamute guard dog rotated nightly in staying at the field headquarters from October 31 to November 14 without incident, so the overnight guard was suspended until further notice. Care was taken each night to chain together the equipment that could not be locked in the field building. Following the discovery of the first aboriginal grave on December 1, the overnight site guard rotation was reestablished until all aboriginal interments had been excavated. The news of their discovery was of course conveyed to the landowner and the Red River Levee Board, from whom other local people soon learned of the finds. Some of the volunteer help from the Arkansas Archeological Society warned the staff of the intentions of pothunters to loot the site if it was left unattended. So these precautions, though time consuming and requiring extra duty from the staff, were well worth the trouble.

The presence of a guard dog for much of the project provided an extra bonus. The dog's presence deterred the nearby cattle from wandering through the excavations in the direct impact zone. As the trenches in the indirect impact zone were too far from the field house for the dog's presence to be of benefit, each day at the close of the work day the excavations in the indirect impact zone were enclosed within a makeshift barbed wire fence.

Establishment of the Grid

The initial task at the start of the excavation program was for the supervisory crew to establish a grid system baseline across the site. On October 23, 1980 the datum utilized during the test excavations (Figure 7-2) was relocated and a north-south magnetic line was established off this point running south across the revetment road into the indirect impact zone. A station was established on this north-south line just south of the revetment road which was designated as grid south 100, east 200 m. Off this point a baseline was set with theodolite and 50 m tapes along the edge of the indirect impact zone (parallel to the revetment) S100 E100 and S100 E225 marked the outer edges of the line. This baseline gave us control across the entire east-west length of the direct impact zone. The artificial grid north-south line run perpendicular to it was measured at 22 degrees 25 seconds east of magnetic north. By designating the grid system in this manner, we had effectively placed our imaginary 0N 0W point to the northwest of the actual site area out in the Red River; thus, all our grid points were in a single south and east quadrant, with all direct impact zone excavations at less than 100 m south and all indirect impact zone excavations at greater than 100 m south.

Overburden Removal

The next task before the arrival of the full crew was the mechanical stripping of the flood overburden in the direct impact zone. We had considered using various kinds of machinery, including a roadgrader, but the highly dissected nature of the site terrain following the cuts by both construction and archeological testing made it impossible for such machinery to operate effectively. Therefore bulldozers were the most efficient equipment for the stripping of nearly a meter of overburden.

Stripping began on October 25 and was completed the next day. A D7 bulldozer and a smaller John Deere bulldozer were rented along with operators from local sources. The stripping proceeded generally from west to east across the direct impact zone, with back dirt being pushed off the river bank (Figure 7-4). The large bulldozer did most of the stripping while the smaller machine cleared out old North-South Trench 2 from the June testing for use as the waterscreening station, and also prepared a platform adjacent to the field building for parking.

A theodolite set over the original site datum was used to establish the line of the high point of the buried site midden along the levee so that machinery could cut down and away from this high point in stripping the surrounding overburden. On the south side of the direct impact zone the levee was purposely cut through to confirm the location of the midden. As the stripping proceeded it became apparent that it would not be possible to leave a clean profile exposed along the south edge of the direct impact zone, as had been planned in the research proposal; backdirt had to be left supporting that cut face to prevent it from collapsing. The stripping revealed the last of the marked graves (Historic Burial 10), a stone engraved with the name "Connors."

Figure 7-4. Bulldozers stripping off the flood overburden, looking east (AAS negative number 807580)

Search for Site Midden Components

Following the clearing of N-S Trench 2, three profiles just over 1 m wide, were cleaned by hand on the west wall of the trench to search for evidence of any occupation levels deeper and earlier than the Caddo IV/V component (Figure 7-5). These profiles were labeled Cuts 1 through 3 from south to north, with Cut 3 being the deepest, extending for 3.92 m below the current ground surface which had itself been stripped of its midden during the original construction of the revetment. The bottom of this cut was probably over 5 m below the preconstruction ground surface. Although clay strata similar to those found the previous June in E-W Trench 3, Section 3 (where the Caddo III midden had been identified) were present at the bottom of Cuts 2 and 3, there was no evidence here of any component earlier than the Caddo IV/V occupation.

Figure 7-5. West profile of N-S Trench 2, profile cut 3. No occupatio levels show below the top of the profile, which was lower than the Caddo IV/V midden (AAS negative number 807591)

Confirmation of Mapping Coordinates

Following a day of rain on October 27, when the bulk of the field crew traveled to Magnolia from Survey headquarters at Fayetteville, unloading of equipment, set up of the field building, and establishment of the water processing station were undertaken (although the pump still had not arrived from the manufacturer). The site grid was again extended into the direct impact zone off the S100 baseline, and 3 m squares were laid out at S42 E178, S42 E181, and S45 E181. These three excavation units were placed to relocate Test Unit 1 from the June testing in order to confirm the accuracy and placement of our combination of the test and excavation grid systems. Our placement was confirmed as shovel skimming in the southeast corner of S45 E181 encountered the northwest corner of Test Unit 1 in floor plan, along with the filled-in grave shaft where Minnie Wilkerson's grave had been removed for reburial by the Levee Board.

Determining Site Stratigraphy

On November 29, shovel testing (five transects each with five test holes) was attempted on the west side of the direct impact zone to determine the distribution of the midden there; these tests were quickly abandoned as it was found that sterile flood deposits still obscured the midden there. That same day, trenching west-east across the direct impact zone was begun with a backhoe to better define the natural and cultural stratigraphy across the site (Figure 7-6). This work, including most profile mapping of the trenches was completed by November 3. Crew chief Guendling supervised the cutting of three trenches (numbered 1 to 3 from south to north) after they were laid out with a theodolite. These trenches were the width of the toothless bucket of the backhoe (ca 1 m) and varied in length. Artifacts found in the walls, soil sample, and sediment peels were mapped in profile before being removed.

Backhoe Trench 1 was approximately 69 m long, running from E151 to E220 with the north wall of the trench at S82. Backhoe Trench 2 was almost 40 m long, running from about E146 to E185, with its north wall at S55. Backhoe Trench 3 was 15 m long, between E158 and E173, at S42. The backhoe was also used to open an area on the east side of the site where a 3 m square was later excavated (S72 E212), as Backhoe Trench 1 revealed that flood overburden still covered the midden deposits on that side of the site.

The eastern 6 m of Backhoe Trench 2 were dug by hand as other excavations (see below) begun while the trenching was in progress made it impossible for the machine to complete that last segment of the trench. A separate hand extention of this trench that was 3 m long was later excavated at S55 E187.35, on the opposite side of a 3 m square excavation unit, to continue the east-west profile within that area of the site.

These trenches confirmed the results of the previous June testing which had determined that the site was centered on a ridge trending from southwest to northeast, on which the historic levee had been built (Schambach et al. 1982), with the midden tapering off on either side of this rise (Figure 7-7). They showed that we had been somewhat cautious in removing the flood overburden, as the midden still was buried by as much as 60 cm of flood deposits on the west side of the site where the midden slipped off more deeply down the bank of a buried slough bank. The trenches cut through the historic levee in two places, permitting accurate mapping of that feature, as well as a historic roadbed, whose ruts appeared in profile in Backhoe Trench 1. Historic graves were encountered in all trenches, providing the first indication that the historic cemetery extended across the entire direct impact zone, and was not a small locus at the north end of the work area, as had previously been assumed. The profile of Backhoe Trench 1 also showed that the east side of the direct impact zone had been cultivated, as undulating crop rows from the last plowing before the site was buried by flood deposits could be seen.

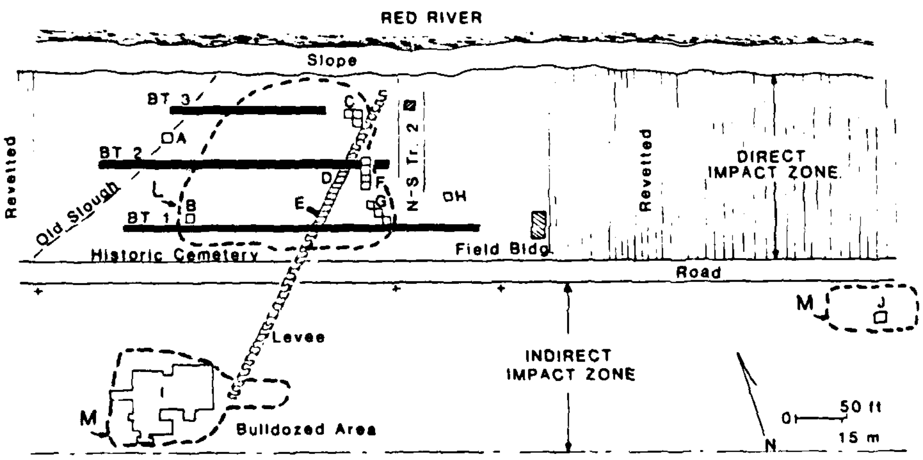

Figure 7-6. 3LA97 schematic excavation site plan. A. 3 x 3 m unit S48.77 E157; B. 2 x 2 m unit S79.27 E161; C. 3 x 3 m units S42 E178, S42 E181, S45 E181; D. Levee Transect 2 x 2 m units (15); E. Levee Transect Unit 12 extension 1 x 2 m; F. 3 x 3 m units S51 E184, S54 E184, S57 E184, ,0 E184; G. 3 x 3 m units S72.5 E185, S75.5 E188, S78.5 E191; H. 3 x 3 m unit S72 E 212 within Backhoe Trench 4; I. area stripped in indirect impact zone (interior of circular house with Features 17 and 18 and two aboriginal burials); J. 3 x 3 m unit in Caddo midden; K. waterscreen location; L. limits of machine stripped and hand cleared area; M. limits of machine stripped areas

Figure 7-7. **Backhoe Trench 3 north profile, showing midden sloping down to the west in a buried slough (AAS negative number 807697)**

In places the backhoe trenches extended a meter or more below the level of the Caddo IV/V occupation midden, showing that there were no additional earlier components within the range of testing possible with the backhoe bucket. This confirmed the results of the profiling done along the three cuts in N-S Trench 2 and the earlier bulldozer trenches made the previous June across both the direct and indirect impact zones. The Caddo III midden found in E-W Trench 3, section 3 that June thus was concluded to be an isolated component that did not underlie the main occupation of the Caddo IV/V inhabitants.

Figure 7-8. **Hand excavations at S51 E184 and S54 E184, looking southeast (AAS negative number 807698)**

Hand Excavation Units (Direct Impact Zone)

While the trenching was underway, additional hand excavation units, 3 m square, were begun to search for settlement pattern. Artifacts found during the excavations were hand-picked and bagged separately from those that were removed in the waterscreens. The midden in these units was shoveled out as a unit and the midden floor was then cleaned and checked for features. The first series of units opened included four squares from north to south at S51, S54, S57, and S60, all E184 (Figure 7-8). The bulk of these units was not completely excavated as the profiles revealed that the northern end of these units had previously been disturbed during the original revetment construction before the site had been recognized, while the southern units were crossed by the remains of the historic roadbed, which had also disturbed any evidence of aboriginal settlement.

Later hand-excavated 3 m squares were dug at S72.5 E185, S75.5 E188, and S78.5 E191. These units were east of the historic levee, in the area that had been cultivated. Although they were completely excavated through the midden level, (all midden soil was waterscreened) and the unit floors were scraped clean with shovels and hoes, no evidence of settlement pattern was found again. These units had been placed in an area which we had judged to be relatively undisturbed.

This was true of excavation unit S72 E212, the furthest east of the large hand-excavated units (the backhoe had been used to remove overburden). Again no evidence of aboriginal settlement pattern was found. On the west side of the levee the presence of the historic cemetery made it difficult to position an excavation unit which could be taken down without disturbing historic grave shafts. Some shovel skimming was undertaken *before* units S48.77 E157 (3 m square) and S79.27 E161 (2 m square) could be placed without intruding on historic features. Unit S48.77 E157 was placed between Backhoe Trenches 2 and 3 where the *profiles showed the midden sloping down into overbank* deposits, in order to specifically sample the clay deposits bearing midden. The smaller unit was opened to search for surviving settlement pattern and to obtain a larger sample of midden from the southwest side of the direct impact zone than could be obtained with small random column samples (see below).

The midden soil excavated from these units was processed at the waterscreening station (see below) through 6.3 mm mesh except some column samples taken out for processing through 1 mm window screen. In eight of the 3 m excavation units (Table 7-1) a single 50 cm square sample was excavated in 10 cm level depths through the midden. These tests provided a control on the kinds and amount of small debris that was being missed by processing the bulk of the excavated soil through the larger screen size.

These samples were selected by dividing the 3 m squares into 36 smaller 50 cm squares, from square 1 in northwest corner, left to right, and top to bottom, to square 36 falling in the southeast corner. A list of random numbers was taken from a random numbers table, so that

Table 7-1. Column samples excavated within 3 m sq units

Excavation Unit	Column samples
S48.77 E157	S49.27 E159, S51.2 E157.16*
S42 E178	S42.5 E179.5
S57 E184	S57.5 E183.5
S60 E184	S62.5 E184
S72.5 E185	S73.5 E186
S78.5 E191	S79 E192
S72 E212	S72.5 E212.5

*extra judgmental sample (nonrandom)

as a supervisor needed to excavate a sample for fine screening, he could simply consult the posted list, check off the next available square number, and begin its excavation. In addition to these randomly chosen column samples within the 3 m squares, one other sample was taken out of unit S48.77 E157 to provide a larger fine sample of the overbank midden deposits encountered in that unit.

Column samples were not taken out of four 3 m squares because they either fell within areas blanketed with historic grave shafts (S42 E181 and S54 E181) or areas disturbed by previous construction bulldozing S51 E184 and S54 E184). No column sample was taken from 2 m square S79.27 E161 as that unit had to be completed quickly, just before the bulk of the site midden was stripped away with heavy machinery (see below).

Midden Column Sampling

As it was impossible to recover the entire midden across the direct impact zone, a sampling strategy using 50 cm square column samples was devised and put into use. These column samples were excavated in 10 cm levels through the midden to provide a standardized quantification of artifact and ecofact volumetric densities across the site. The excavated soil was processed through 1 mm window screen.

The locations of the column samples were generated through use of a program prepared by Sandra Parker using the University of Arkansas Computer Center. A map of the undisturbed portions of the direct impact zone, based on the results of the June testing (Figure 7-2) was used to produce a computer map running between 30 and 90 m south and between 135 and 222.5 m east, with various modifications including ommission of the areas of N-S Trenches 1 and 2, and the northeast corner of the direct impact zone which had been bulldozed away during construction.

The computer program generated 20 transects across this area from north to south, with 236 sampling points along the transects. This subdivision of the site area into transects, rather than simply sampling the total area, was a necessary compromise for speed and efficiency in laying out the sample units on the ground off the S100 east-west baseline. The computer generated coordinates were also rounded off to the nearest whole meter.

The computer was then programmed to randomly order the 236 sampling points, and print out their coordinates, and the distances required to lay them off the baseline. From this list 50 column samples were laid out by tape measure and surveying instruments. Once the northwest corner of a column sample had been marked with a surveyor's flag, a wood frame 50 cm square was laid on the ground and the other three corners were marked out, and the square was encompassed with string.

Originally a sample of 150 columns (a 1% sample of the direct impact zone area) had been projected based on average excavation time for such samples at the Phillips Spring site in Missouri (Marvin Kay, personal communication). However, the sampling at Phillips Spring had been on a site where the midden levels were well defined and easily accessible, whereas we found that the differential stripping of the flood overburden often left a considerable depth to excavate before the midden was encountered (Figure 7-9). This slowed down the excavation of many of the column samples and we had to cut down the number of samples. Although the lower number of samples reduced the statistical reliability this was not considered to severely handicap our analysis as other excavations had already shown that the midden distribution might be suspect due to the accumulated disturbances from historic levee construction and road building, cultivation, and grave digging.

More than 50 column samples were actually laid out, as they were found to often fall in areas where the midden was totally disturbed by historic features or areas already removed by larger excavation units. Some under

Figure 7-9. Excavation of a column sample through flood deposits (AAS negative number 807749)

large backdirt piles, were lost to flooding or fell in areas off the occupation area, as shown in the continuing field investigations. In such cases the undiggable midden samples were abandoned, and the next sample in the list was picked until a clear midden area could be excavated. To obtain the 50 samples 83 locations were investigated. Although 52 of these samples were actually excavated, after assessment of their soil profiles and some compromises in their locations, four samples were eliminated from the random statistical sample leaving a total of 48 samples for analysis of midden distribution (Figure 7-10 and Table 7-2).

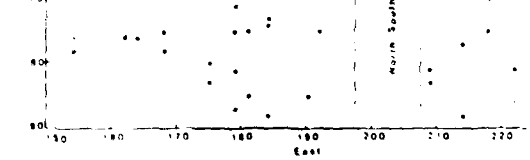

Figure 7-10. Distribution of random midden column samples (open squares are columns where a historic burial was hit; filled-in squares are part of the random sample; circles represent columns slightly off coordinates but still used in calculations)

Table 7-2. List of random midden column samples

S60 E154	S62 E164	S83 E175	S40 E164*
S64 E154**	S76 E164	S46 E179*	S69 E184
S76 E154	S41 E168	S61 E179	S73 E184
S78 E154	S51 E168	S63 E179	S74 E184
S59 E157	S56 E168*	S68 E179	S88 E184
S69 E157**	S63 E168	S71 E179	S54 E190
S75 E157	S75 E168	S75 E179	S59 E190
S49 E162	S78 E168	S81 E179	S85 E190
S76 E162	S40 E175	S87 E179	S81 E209
S39 E164	S57 E175	S38 E181	S83 E209
S43 E164	S60 E175*	S54 E181**	S77 E214
S52 E164	S65 E175	S75 E181	S88 E214
S59 E164	S80 E175	S85 E181	

*lost to historic burials
**moved from other location (due to obstruction)

The Levee Transect

As noted under the discussion of the trenching above, the profiles of Backhoe Trenches 1 and 2 revealed the muck ditches and overburden from a historic levee. By lining up on these features in the profiles, a 2 m wide transect, roughly corresponding to the width of the levee between the muck ditches, was laid out between the two backhoe trenches. This transect was subdivided into 2 m squares, numbered 1 to 14 from north to south (Figure 7-11); later another unit, labeled "0" was added north of Backhoe Trench 2, and the area that would have included unit 14 was excavated in concert with that of unit 13 (Figure 7-12). A rectangular trench 1 x 2 m in dimensions was laid off Levee Transect Unit 12 and was designated as its "west extension."

These units were excavated by hand in two levels, an upper one consisting of mottled overburden of the levee, which contained mixed aboriginal and historic debris, and the undisturbed dark aboriginal midden below this built up layer. As with other units, handpicked artifacts were kept separate from those recovered at the water processing station. Control was maintained by checking against the profiles of the unit walls, and the field crew generally had no difficulty in distinguishing the difference between these two strata, and the muck ditches of even blacker midden that sometimes cut through the units.

Balks were left between the levee transect units to maintain control of the two strata. Once all transect units had been excavated, soil samples were removed from some of the balks and the rest of them were checked for artifact content. After the midden was excavated the floor of the unit was gone over with shovels and hoes to search for possible settlement pattern.

The bulk of the excavated soil was processed through 6.4 mm mesh as were the other hand excavated units. Random column samples were taken out of Levee Transect

Figure 7-11. The levee transect, with excavations in units 12, 11, 10, 9, 8, 6, 5, and 2 (from foreground to background), looking north-northeast (AAS negative number 807752)

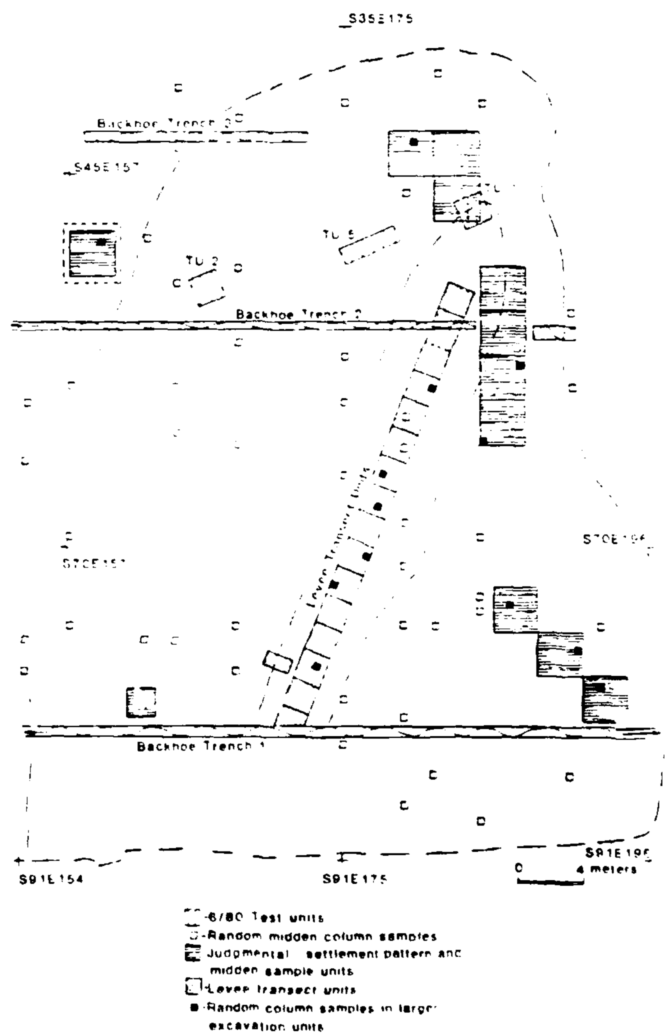

Figure 7-12. Excavation units in the direct impact zone west of N-S Trench 2

Units 2, 5, 6, 8, 9, and 12 for processing through 1 mm screen. The two m squares were subdivided into 50 cm square sampling units, as was done for the larger 3 m squares, with the subunits numbered from 1 to 16. Again, a list of random numbers was generated for selection of the squares. Three column samples from the overall site midden sampling also fell within the levee transect (S61 E179, S63 E179, and S54 E181). They were excavated before removal of the levee transect units they fell within.

As an additional check on our recovery techniques all midden from Levee Transect Units 2 and 11, and both the midden and levee fill from Levee Transect Unit 12 were processed through 1 mm mesh rather than 6.4 mm screen. The resulting debris, mostly daub, was so great that it rapidly clogged the 1 mm mesh and made it difficult to quickly process the entire sample. This sampling showed that it would not have been practical to have waterscreened the bulk of the excavated soil through the smaller mesh, and reinforced our strategy decision of using large screens with selected samples of different excavation units being processed through the smaller mesh.

After the other hand excavated units and random site midden column samples had been completed the levee transect was left standing as a guide for the stripping of the remainder of the midden in the direct impact zone.

Stripping the Midden and Preparation of the Indirect Impact Zone

As of November 20 all hand excavation units that could be dug in the direct impact zone outside the levee transect were completed. The next day stripping of the remaining midden outside the levee transect was begun with a tractor pulling a self-loading blade (Figure 7-13). The day after that a D7 bulldozer joined in the machine stripping. Again it was concluded that other heavy equipment, such as a roadgrader, could not be used efficiently within the confined limits of the opened excavation units.

Backdirt piles for the stripping were made on the west side of the direct impact zone, beyond the site occupation area, and on the northeast side of the direct impact zone which had been previously stripped of its midden during construction. Crew members checked these backdirt piles after dirt loads were deposited and any artifacts found were handpicked. In one case this close monitoring of the backdirt led to our being able to associate the debris in the backdirt with a feature revealed in the previous machine cut; part of the jaw of the dog buried in Feature 10 was placed back with the rest of the skeleton.

Generally the bulldozer was used to remove the bulk of the midden, with the tractor and self-loading blade then making passes after the heavier machine had moved on. The tractor and blade gave a shallower but cleaner cut through the soil. However, the bulldozer was more effective at rearranging the backdirt and in stripping through harder packed areas and clay deposits, such as were found in the historic roadbed on the east side of the levee. All of machine work was done under supervision of members of the supervisory staff.

Waterscreening operations were closed down during the stripping, as little excavated soil was being removed by hand. The small hand excavations then ongoing in the levee transect had their dirt stockpiled. The bulk of the crew followed behind the machinery after their passes were complete, and cleaned the subsurface floor with shovels and hoes to search for evidence of settlement pattern (Figure 7-14). Potential aboriginal feature were marked with red surveyor's flags, while historic grave shafts were marked with a contrasting florescent orange flag. These flags were placed in the center of the identified features. Other crew members were temporarily released from the hand cleaning to assist the supervisors in recording the progress of the stripping.

Once all midden had been stripped with the machinery in the direct impact zone, the machines were moved over to the indirect impact zone and were used to reopen E-W Trench 4 and Section 3 of E-W Trench 3 for later excavations in those areas. This machine work was completed in four work days, interrupted on November 23 by rain.

On November 25 the site was closed for four days of Thanksgiving vacation, which coincided with the arrival of a severe sleet and rain storm that would have made it impossible to have worked on the site in any case.

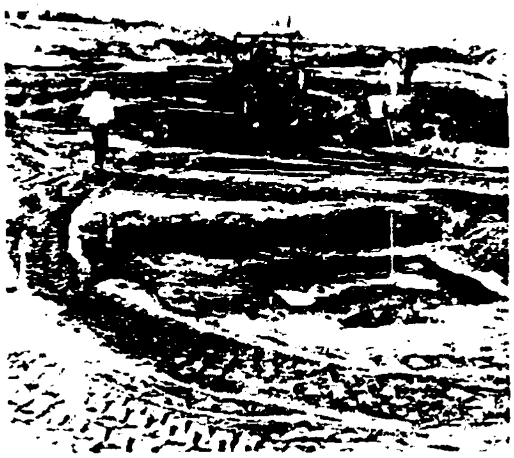

Figure 7-13. Tractor and self-loading blade stripping the midden, looking northwest (AAS negative number 807925)

Figure 7-14. Hand cleaning the stripped submidden surface, looking south on the west side of the levee (AAS negative number 807931)

Definition of Features

After the four day break, the hand cleaning of the stripped midden subsurface continued. Various features appeared across the site in the area hand cleared west of N-S Trench 2 (Figure 7-15). These features were concentrated on either side of the historic levee; on the far east side of the direct impact zone hand cleaning revealed no evidence of any features, either aboriginal or historic. No features were noted in a 10 x 10 m area stripped east of N-S Trench 2 in an area centering on S72 E200. The total area handcleaned in the direct impact zone amounted to ca 1,717 sq m surrounding the levee transect with an additional 10 sq m east of N-S Trench 2 near S72 E200.

Aboriginal features at first were circular stains in floor plan, which were designated either as possible postmolds or pit features based on their size and shape in cross section profiles. This distinction was arbitrary in the field, and only analysis of the soil and artifact samples taken from these features (see below) provided better functional definitions.

However, despite diligent searching no aboriginal burials, which had been projected as being present on the site, were found until December 1, when shovel scraping and hoeing finally revealed Burial 1, which had been exposed by the machine removal of the midden. There was hardly any indication in the soil of a burial pit outline, and this caused concern about whether such features could be discerned at all in the sandy subsoil, given the stripping techniques we had been utilizing.

It was determined at that point to obtain a probe from the Magnolia Survey station and begin searching the direct impact zone for submidden aboriginal burials. Additional probes were obtained from Blan Ellis, Jr., a volunteer working at Cedar Grove, who is also a member of the Arkansas Archeological Society, Dan F. Morse, Survey station archeologist at Jonesboro, and Ann M. Early, Survey station archeologist at Arkadelphia.

The systematic probing was begun on November 6. Eventually the areas between the historic graves, inside the levee transect, and immediately to the east of the levee

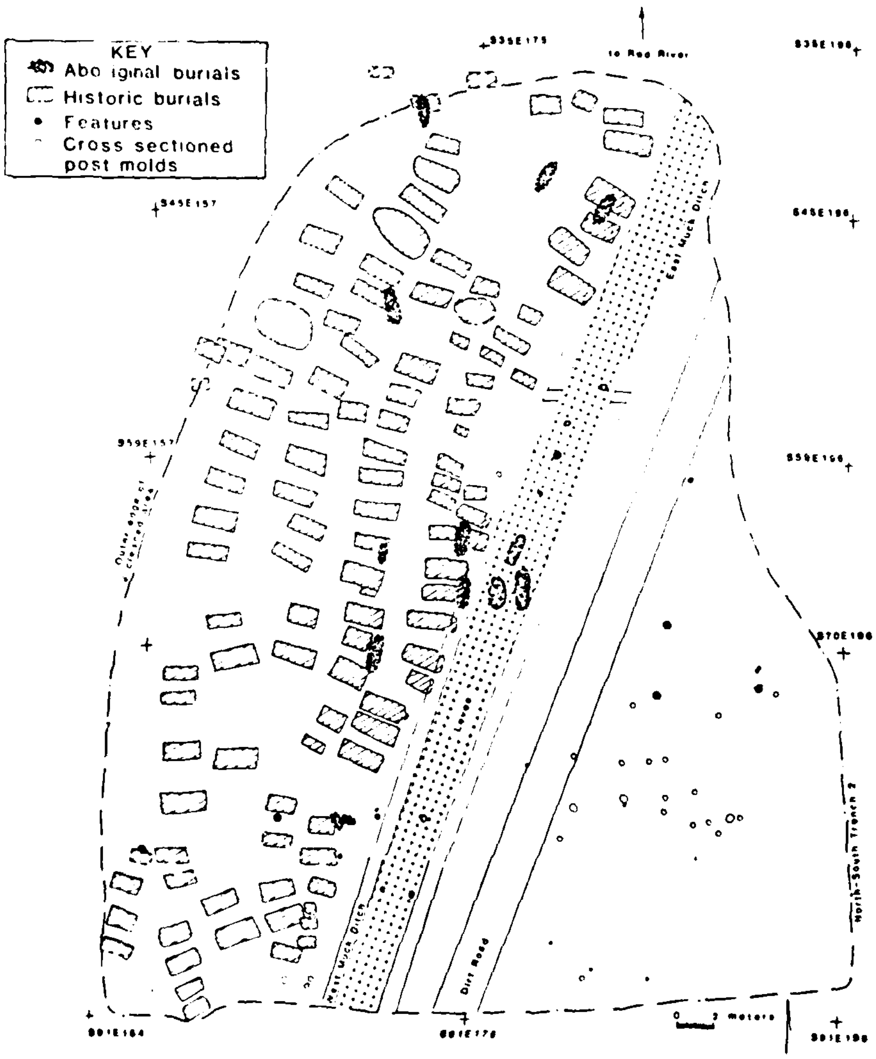

Figure 7-15. Features in the direct impact zone

were all covered by closely spaced probe holes (Figure 7-16). This coverage ran across the highest part of the old natural site rise, the area most likely to have contained aboriginal interments. Most of the east side of the levee transect was removed with a slip scoop to make it easier to probe beneath that feature. Probing under the west side of the levee transect was accomplished by using one long probe and coming in underneath at an angle, after the levee remnant was probed from the top. (After the testing at 3LA128 was completed in January of 1981, a bulldozer that was utilized for closing down that site was brought to 3LA97, and the remainder of the hardpacked historic road east of the levee was stripped away. This permitted probing of the ground below that feature; no additional aboriginal features were found there when the probing was done on June 13, 1981.)

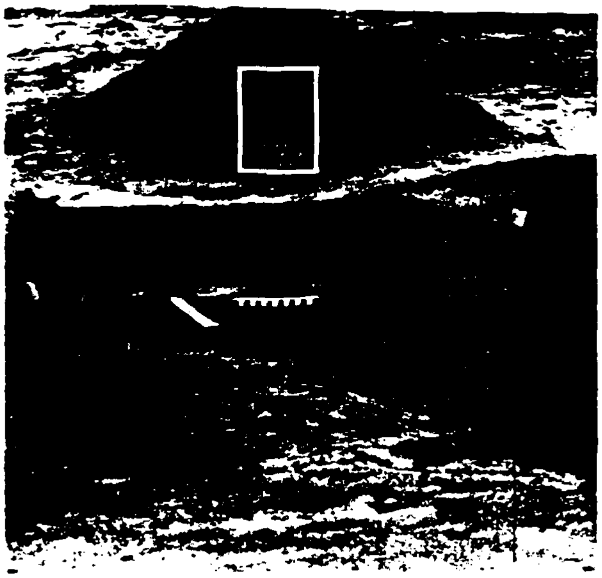

Figure 7-16. Probe hole spacing in Levee Transect Unit 0, looking north (AAS negative number 807957)

Eleven additional aboriginal interments and two historic grave shafts were discovered in the direct impact zone by probing. Although there was the possibility that additional aboriginal graves might still be present amid the historic cemetery, additional probing beyond that done between December 6 and December 20 would have required a disproportionate labor and time investment; this could not be justified for the small returns likely within the available time frame. (During the recovery of the historic cemetery in the summer of 1982 only one additional aboriginal burial was found--a small child that was beneath the west muck ditch. This confirmed the original field decision.)

The staff members who participated in the probing could distinguish by feel the difference between their hitting bone, ceramics, or plant roots. Nonetheless, hard contacts of the probe were checked out to determine what had been struck, by digging a small hole down to the object. When these holes confirmed the presence of bone or pottery, the area immediately around the find was cleaned back with shovels and hoes to identify a grave pit outline. This work was simplified as it soon became apparent that all aboriginal graves were oriented roughly north-south.

Like Burial 1, the grave pits' outlines were generally not visible to the naked eye until the excavations started to reveal the skeleton. The fill of the grave pits was almost entirely sterile sand, with little or no trace of midden debris. It was concluded that the burials had been dug before the extension of the general midden over them, thus explaining our difficulty in seeing grave pit outlines in the sandy soil below the midden.

As it was concluded on the basis of the ceramics that the site dated into contact times, it was further assumed that there was a possibility of European manufactured metal trade goods being present in aboriginal graves on the site. Therefore, metal detector searches were employed across the stripped direct impact zone in the vicinity of other aboriginal and historic features.

Two different metal detector surveys were made, first by the project archeologist on December 4, and then by Ann Early's assistant Mark Hubbs on December 15. Trubowitz employed a Metrotech Model 220 which produced variable metal finds, including a coin, some chain, and a .22 cartridge case from just below the surface, but it was later found that this instrument survey had missed pieces of metal wire fence. Hubbs used his own Garrett Groundhog VLF/TR (a low frequency transmitter/receiver) which has the ability to discriminate among ferrous and nonferrous metals. The depth range on that instrument in his four years of experience with it was up to a maximum of .76 m. Although he turned up additional metal debris from the historic occupation, no evidence was found of aboriginal interments with this metal detector either. As it later turned out, though, none of the aboriginal burials that were discovered by probing had any metal grave goods.

However, the effectiveness of the probe was definitively demonstrated in the discovery of Aboriginal Burial 14. Probing between historic graves 11 and 23 below the historic graves revealed a mussel shell that was laid over the left arm of the Indian burial. This aboriginal grave was then found to be undisturbed except for one missing leg bone, below the level to which the historic graves had been excavated.

Feature Excavation

Aboriginal features such as shallow pits and possible postmolds were cross-sectioned to confirm their artificial origins. The two dog burials identified in the field (Features 4 and 10) were removed as blocks and were taken to the laboratory for excavation. For postmolds a soil sample was taken from the cross-sectioned half, and after drawing the profile the other half was removed for flotation processing. Except for handpicked artifacts and soil samples the dirt from half of each pit feature was floated.

Aboriginal human burials were excavated in floor plan with hand tools. Soil samples were collected and the rest of the grave fill was usually floated. Excavation of eight of the 14 aboriginal interments was complicated by their having been disturbed in part by historic grave shafts. To recover some of the missing sections of the aboriginal burials, and to see if the historic grave diggers had removed any of the grave goods, some of the historic grave shafts were checked for position of the historic coffin and body. When the depth of the historic interment had been confirmed, a portion of the grave shaft fill above that level was shoveled out for waterscreening through 6.4 mm mesh; by this means some parts of the disturbed aboriginal skeletons were recovered and it was ascertained that the grave goods had been removed during excavation of the historic grave shafts.

As removal of the historic graves was specifically not part of the aboriginal data recovery contract at Cedar Grove, the locations of the historic graves encountered were mapped and marked with surveyor's flags, but no further excavation was made in those features other than the shaft checks mentioned, and work around Burial 14 (see Chapter 9).

Excavations in the Indirect Impact Zone

Excavations in the indirect impact zone were deferred until the bulk of the research in the direct impact zone had been completed. Although this strategy meant that ultimately we were not able to completely excavate some of the features we investigated there, it was justified as there was no immediate danger to the indirect impact zone right-of-way, whereas any data not recovered from the direct impact zone would be lost to construction of the revetment.

The primary task in the indirect impact zone excavations was to locate the house structure found the previous June in testing (Feature 3). Once the heavy machinery had stripped off the overburden of old E-W Trench 4 plus an expanded area surrounding it, the grid was extended into the indirect impact zone and three 3 m squares (S138 E130, S141 E130, and S144 E130) were opened to search for the structure settlement pattern. Postmold 5 from the June tests was relocated, but this feature as it turned out was an interior support post or small pit, and it was not immediately clear which direction the house wall would be found. Exploratory trenches were first run off the 3 m squares (including a 1 x 4 m trench from S147.1 E131.4 and a 1 x 9 m trench from S140.5 E133) and then some larger areas to the northeast of Postmold 5 were cleared using a slip scoop pulled by winch.

Unfortunately for the prehistoric archeological remains of the Caddo occupation the historic cemetery was found to extend into the indirect impact zone. Thirteen additional historic graves were found there, possibly lined up in four or five rows, again roughly facing from west to east, on the west side of the levee. These graves disturbed portions of the house pattern and the features within it.

As time was running short and it was immediately evident that the historic cemetery also extended into the indirect impact zone (Figure 7-17) and had caused disturbance of the aboriginal deposits, most of the midden soil in these exploratory units was not sent for water processing. Any observed artifacts were handpicked, and samples of the midden soil were collected in measured bucket volumes for water processing. Column samples from S138 E130 and S141 E130 were also taken (at S139.5 E132 and S141 E131.5 respectively). Features (pits, postmolds, and aboriginal interments) were excavated in the same manner as in the direct impact zone, although only selected postmolds could be profiled for verification, as there was not time to check all of them.

As the project drew to a cl/se there was time only for excavation of a single 3 m square in the Caddo III midden in old E-W Trench 3, Section 3. The midden was shoveled out for processing t -ough 6.4 mm screen, and the floor of the unit was shovel scraped to check for possible features. No features were found.

Special Samples

Archeomagnetic samples were collected from the only feature (17) with a fired clay lens that had potential for dating by that means. Radiocarbon samples were recovered from Features 17 and 18 and some charcoal found in the midden in Levee Transect Unit 12. Thermoluminescense samples were selected in the laboratory from shell-tempered sherds found in Features 17 and 18 and the midden from Levee Transect Unit 12.

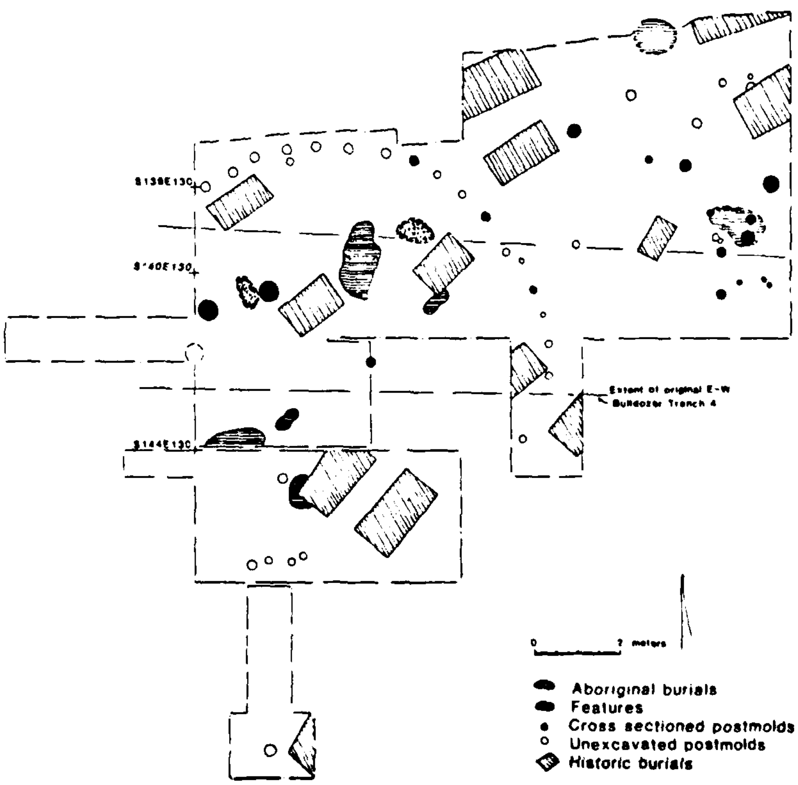

Figure 7-17. Features in the indirect impact zone

Although suitable material for the collection of tree ring samples was not found at Cedar Grove, collection materials for such samples were available in the field had they been found. Soil peels were attempted in the three backhoe trenches, but these were generally unsuccessful in some of the clay sediments encountered, and as rainfall destroyed some of the samples before they could dry adequately for removal. Soil samples from general stratigraphic profiles (not features) were collected in plastic bags and were later air dried at the laboratory before repackaging them.

Water Processing

As noted several times in the preceding discussion of the field methodology, all excavated soil, excluding special samples and handpicked artifacts, was to a waterscreening station for processing. This station was set up in N-S Trench 2 (Figure 7-18) which descended to the river and provided a convenient access for setting up a pump that was the power source for the operations.

The pump utilized was a Homelite heavy duty trash pump (model 122TP3), with a 3 inch intake and a capacity of 23,000 gallons per hour. A total of two waterscreens and two flotation devices could be operated simultaneously by the pump. The waterscreen consisted of a sluice box feeding a screen frame with two compartments. Screens of either 6.4 mm or 1 mm window screen were slid into the frame depending on the kind of sample being processed and the data recovery contemplated.

The dirt was brought down to the sluice and directly dumped from the wheelbarrows. Smaller proveniences such as column samples and flotation samples from features, were brought down to the waterscreens bagged in plastic sheeting or heavy duty plastic trash bags. In a few cases open backed pickup trucks were driven directly to the waterscreen and the dirt was shoveled into the sluice directly from the truck. However, most of the dirt was brought down by wheelbarrow.

Dirt was dumped into the sluice and pretreated with water before it was allowed to flow into either one or both of the screen compartments. This water soaking before screening helped speed the processing and allowed better control over the load of soil in the screens, than would have been afforded by direct dumping of the dirt into the screens. Some of the excavated soil was high in clay content and these samples were presoaked in wheelbarrows or large tubs in a solution of water and trisodium phosphate, usually at least overnight, before they were dumped into the sluice for processing. The trisodium phosphate helped break up the bonds between the clay particles so that the soil could be screened. This technique was based on similar treatment used at Phillips Spring, Missouri (Marvin Kay, personal communication). A 22 kg bag of trisodium phosphate lasted to the end of the project.

Flotation samples were processed through two flotation tubs patterned after models developed by Bill Robertson for the Shell Mound Archaeological Project (Watson 1976). The drum containers were fed from the pump through the bottom, forcing light debris up through an inner drum, over a sluice to be caught in two nested U.S. standard sieves (one 6.4 mm mesh and one .4 mm fine sieve; a number 6 and number 40 sieve respectively) that were held within a bucket at the end of the sluice. The "treated" water, sans artifacts and flotation ran out of holes cut in the sides of the buckets at the bottom. Heavy fractions were caught in a screen in the inner drum. A tire innertube collar between the inner drum and the outer 189 liter container helped force the water to exit up from the bottom, leaving behind only the heavy fraction.

In practice it was found that some of the heavy fraction was so voluminous that it clogged the inner drum screen, and this material had to be scooped out of the drum even though the dirt in the drum was kept stirred with a short handled hoe or a shovel handle. This scooped out material was placed in the 6.4 mm nested screen, which was included with the other heavy fraction when the sample processing was completed and the drum was dumped on a 1 mm screen to dry. Thus, some of the larger floated material (mostly modern vegetal debris such as roots and

Figure 7-18. Waterscreening station in N-S Trench 2, looking west (AAS negative number 807755). Note profile cuts in trench wall.

leaves) was incorporated back with the heavy fraction, while only the smaller light flotation fraction that passed through the larger mesh was separated out during the flotation process. This light fraction was dumped out of the sieve for drying onto tightly woven nylon fabric laid on a window screen. The fabric was bundled around the sample and tied shut with its provenience tag for transportation back to the laboratory.

Dirt from each provenience that was processed by flotation was measured by volume. Seventeen liter capacity buckets were filled with dirt before they were emptied, a few liters at a time, into the flotation device. Lesser amounts of soil were measured by a graduated measuring stick which was placed in the middle of the bucket. An inventory list was kept to total the number of liters processed from each sample or the number of bags or wheelbarrow loads of screened soil.

Both the flotation devices and the sluice box and waterscreens were flushed out and hosed clean between different provenience samples. Completed screens were slid out of the frame and laid out to dry along the sides of the work trench, supported on wood and rope racks so that air could circulate underneath the screens and dry them more quickly.

Provenience control was maintained with color-coded surveyors' flagging. At the excavation unit the field serial number was written on a solid colored piece of flagging, which was weighted down by tying to a metal washer. The color codes told whether the sample was to be put through 6.4 mm, 1 mm mesh, or was to be floated. A striped piece of flagging of the same color as the solid ones informed the waterscreening crew that they had received the last load from a particular provenience. These tags were placed with the dirt sample, were washed along with the artifacts, laid out to dry with the material caught in the screen, and then one tag was enclosed in the cloth bag which was used for carrying the sample back to the laboratory. One of the provenience tags from multiple loads was wrapped around the exterior of the cloth bags as well, and the extra tags after processing were disposed of and the washers were recycled. Not all flotation samples could be processed before the project left the field. Unprocessed samples were returned to the Survey laboratories at Fayetteville in their original plastic bags for completion of the flotation process. The same flotation devices were set up and utilized, although the water supply was run off a building spigot rather than the pump. Water pressure was strong and sufficient for the flotation.

After the laboratory and field processing through flotation devices or waterscreens had been completed, the written summaries were tabulated for the number of loads and volume of dirt processed by these methods. A total of just over 4,000 liters of soil were floated from 87 proveniences at Cedar Grove. Two hundred and forty-five levels from all column samples were processed through 1 mm mesh, and an additional 54 wheelbarrow loads from four other proveniences were processed through 1 mm mesh. The bulk of the soil was processed through the 6.4 mm screen, totaling 916 wheelbarrow loads (from 46 proveniences) and two pickup truck loads. Given an average wheelbarrow load volume of 280 liters, and an estimated truck load equivalent of 10 wheelbarrows, plus an average volume of 30 liters per column sample level, the total volume of dirt processed from Cedar Grove came to 288,550 liters as shown in Table 7-3.

Not only was a large volume of dirt processed by water processing, but it could also be done rapidly, as on some days as many as 150 wheelbarrow loads were processed. Stockpiling the dirt from each provenience and then running only a single provenience at a time through the waterscreens proved more time efficient than running two different loads simultaneously in the divided screen compartments. It also reduced the risk of accidental combination of samples.

Table 7-3. Volume of dirt processed for Cedar Grove

Screen Size	Loads	Liter/Load	Total Liters
	flotation		4,000
1 mm	245 column samples	30	7,350
1 mm	54 wheelbarrows	280	15,120
6.3 mm	916 wheelbarrows	280	256,480
6.3 mm	20 wheelbarrows	280	5,600
Total			288,550

Laboratory Methods

Once archaeological materials from the Cedar Grove site were brought into the laboratory, their field serial numbers (FSN) were either checked off on the collection processing inventory (CPI) form or a running list was kept of FSN's brought into the lab for processing. This list was then checked off on the CPI's once they were available. All the material recovered from each FSN was recorded on a sort card (Appendix XI). Treatment varied according to the nature of the material and is discussed below.

Soil Samples

The 193 soil samples were air-dried from one to four days on waxed paper placed on screens. Once dry, a standard box supplied by the University of Arkansas Soil Testing and Research Laboratory was filled and appropriately labeled. The remaining soil was wrapped in aluminum foil, labeled, and placed in a plastic bag. If the entire sample filled a laboratory box this was noted on the list of soil samples. Boxed soil samples were placed in cardboard trays in numerical order. Bagged soil samples were placed in cardboard boxes and segregated by origin (either vessel or feature). Sediment peels were boxed flat as they were brought in from the field.

Flotation

Wet flotation samples which came into the lab were allowed to air dry, however, most samples were dry by the time they came into the lab. The light fraction was weighed but not sorted. The heavy fraction was screened through 12.7 mm and 6.4 mm hardware cloth. Materials which were caught in the 12.7 mm and 6.4 mm mesh were sorted and recorded, while those materials which passed through the 6.4 mm mesh were weighed and placed with the light fraction materials (in separate bags).

Handpicked Artifacts and Waterscreen Materials

Handpicked artifacts were washed in the lab, screened, sorted, and recorded. Both handpicked and waterscreened materials were screened through 12.7 mm and 6.4 mm mesh. Any materials which fell through the 6.4 mm mesh which could be sorted were weighed and placed in a Fine Screen Category. Materials which fell through the 6.4 mm mesh which could not be readily sorted were weighed and retained in an unsorted category.

Human Bone

All human bone from burials came into the lab wrapped in newspaper with FSN tags taped on the outside. FSNs were recorded and the bone was left wrapped and not

cleaned. Bones from each individual burial were placed in separate boxes which were appropriately labeled with the burial number and inclusive FSNs. This material was not recorded on the sort forms. It was delivered in its original packing to the bioarcheologist for processing.

Animal Bone

The two dog burials were brought into the lab unexcavated. These were transported back to Fayetteville and subsequently excavated there by Nancy Shaw. The associated soil was screened through a number 40 sieve and floated as well. Bone was weighed and recorded on sort forms, but not screened, and placed in the faunal category.

Bone/Antler Tools

These tools were generally in a state of excellent preservation and were allowed t air dry before cleaning with a dry paint or toothbrush. The only exception to this was the antler projectile points. Their hollow centers were cleared of soil as soon as possible to avoid fractures caused by the antlers drying and contracting around the soil in their centers. Recognized bone and antler artifacts were not actually screened but their size was assessed in relation to screen size and this information was recorded along with their weights on the sort forms. These artifacts were placed in the faunal category.

Shell

Most unmodified shell came into the lab with soil in the shell interior. These mussels were cleaned in Fayetteville where the soil was carefully removed and placed in University of Arkansas Soils Lab boxes. This soil was given an FSN separate from the shell. Shells were not washed but cleaned with a dry toothbrush. Shells in extremely fragile condition were treated with a water-thinned solution of polyvinylacetate (PVA) in acetone. Shell was not screened but when possible screen size was assessed and this information plus weights were recorded.

Modified shells such as ornaments were cleaned and recorded in the same manner as the mussel shells but were not treated with PVA since they were in better states of preservation. When possible, ornaments were strung in their original order and orientations were noted with attached tags. All shell artifacts were placed in the faunal category.

Ceramics

Whole vessels from burials were allowed to air dry under a cloth in an enclosed cabinet if they were too damp to work with when they came in from the field. However, most vessels were dry enough to allow immediate removal of interior soils with wooden sculpting tools and metal spoons. This soil was screened through 6.4 mm mesh to catch any artifacts or bone but otherwise was treated in the same manner as described above for soil samples. The vessels were then allowed to air dry once again under cloths in an enclosed cabinet for a day and then brushed clean with a paint or toothbrush and labeled on the bottom. A few vessel fragments in excellent condition were placed in a sonic cleaner at the suggestion of Frank Schambach. Whole or reconstructable vessels were recorded as a "1" under the unscreened category on the sort card; otherwise counts of sherds were recorded.

Sorting Procedures

Dry screening in the laboratory through 6.4 mm and 12.7 mm meshes facilitated sorting of the artifacts into size ranges. After materials were screened they were sorted according to categories present on the sort form. These categories were chosen on the basis of being easily separated materials that would not add too many "analysis" judgments which would have to be rechecked or repeated once the analyses by the consulting specialists began. In addition, for some samples, the time it took to screen, sort and label these materials was recorded. For many FSNs the time was not recorded principally because several people were involved in each aspect of this procedure and the information was not coordinated. Once materials were sorted, they were placed in separate plastic bags and a tag was inserted which noted the screen size, FSN and category of material. Materials of 12.7 mm size were labeled on their surfaces with India ink and tool fragments or unusual artifacts in the 6.4 mm category were labeled as well. Daub, metal, dating samples, "slag," and floral materials were not labeled with ink.

Most category definitions on the sort forms are self-explanatory but a few may need some explanation. The chipped stone category includes cores, core fragments, preforms, and tools such as drills and points. The ground/polished stone category encompasses pecked stone as well (e.g., hammerstones, pitted stones) and also includes the few resharpening flakes from probable celts or axes which were noted. Unusual artifacts were noted on the back of the sort card.

The flakes/blocky fragments/shatter category was principally composed of flake debitage (whole and fragmentary) with definable features of conchoidal fracture although some materials exhibiting flat fractures without conchoidal features were noted and placed in this catchall category as well. Lithics miscellaneous refers principally to unmodified materials such as pebbles or cobbles, but some materials such as fragments of sandstone which would not normally be used in chipped stone manufacture and exhibited no characteristics of conchoidal fracture were included in this category as well.

Three other categories of materials were added to the list on the sort forms in some cases. These include fired/unfired clay which was weighed and bagged separately but placed in the daub boxes for storage. "Slag" was also bagged separately, counted and placed in with the historic materials initially. Unknown included materials which eluded identification and was counted, bagged separately, and placed in storage with the lithics. These categories included only a few specimens.

Total Material Processed

The totals of the materials processed by their sort form designations are shown in Table 7-4. Daub was the most abundant material recorded in total weight. For those artifact categories that were counted ceramics were the most abundant. Aboriginal materials predominated over historic materials in both weights and counts.

Special Problems and Suggestions

Preservation problems were noticed during the Cedar Grove project involving antler projectile points and whole ceramic vessels. Some suggestions may be of use to others on future projects. The antler projectiles need to be cleaned in the field before they dry out as once the hollowed antler starts to dry and contract around the soil it begins to split. Once the antler splits, removal of the soil from its interior will not allow it to return to its original shape even if the antler is still damp.

Whole ceramic vessels generally require the same care and it would be preferable for them to be cleaned in the field since the combination of the weight of the soil,

Table 7-4. Rough sort totals for all collections

Category	Count	Weight(g)
Aboriginal ceramics	33,660	
Daub		41,727.5
Chipped Stone	1,556	
Ground/Polished Stone	102	
Flakes/Blocky Fragments/Shatter		17,135.6
Miscellaneous Lithics		5,534.5
Flora		409.2
Fauna		8,895.5
Glass	132	
European Ceramics	16	
Brick		123.9
Metal	408	
Synthetics	8	
Unknown	73	
Unfired Clay		251.0
Fired Clay		4.0
Slag	67	
Pigment Samples	4	
Fine Screen Samples		46,106.4
Soil Samples	191	
C-14 Samples	18	
Archeomagnetic Samples	1	

contraction of the ceramic on exposure to air, and shock of transportation from field to lab often results in hairline fractures. If the vessels cannot be cleaned in the field it might be advisable to wrap them in damp fabric or some other material to keep them from drying out before removal of soil can be accomplished.

As the whole vessels were dry brushed clean in the laboratory rather than water processed, it became evident on some of them that pigments had been smeared on the exterior surface of the vessels as well as rubbed into the incised decorations. Future researchers would be well advised to save a sample of ceramics from Caddo midden for such dry cleaning and inspection for surface pigments.

ANALYSIS PRIORITIES

As portions of 3LA97 and 3LA128 were subjected to historic disturbance and factors such as erosion, varying excavation methodologies, and aboriginal discard behaviors produced contexts with variable scientific value to the question addressed by our research design, analysis priorities were necessary. Assignment of three priority levels can be made based on a case evaluation of each provenience. These levels are:

Priority I Samples

3LA97. Aboriginal burials (1-15), Aboriginal features (3-7, 9-21), Undisturbed midden deposits from Levee Transect Units (0-14), Random Column Samples (ca 50 units), Overbank midden in S48.77 E157, and Caddo III midden 3 m square (Cedar Grove I component).

3LA128. All samples.

Priority II Samples

3LA97. Aboriginal postmolds (5-79), Excavation units in moderately disturbed midden (includes: S79.27 E161, S72.5 E185, S75.5 E191, S78.5 E191, S72 E212, S141 E123.75, S138 E130, S141 E130, S144 E130, S147.1 E131.4, S140.5 E133, exploratory trenches).

Column samples within larger excavation units (includes: S49.27 E159, S51.1 E157.16, S57.5 E83.5, S62.5 E184, S73.5 E186, S76 E190.5, S79 E190.5, S79 E192, S72.5 E212, S139.5 E132, S141 E131.5), Samples from the historic muck ditches (Features 1 and 22).

Priority III Samples

3LA97. Excavation units in highly disturbed midden (includes: S42 E178, S45 E181, S51 E184, S54 E184, S57, E184, S60 E184), Levee Overburden samples (Feature 2) (includes: Levee Transect Units 0-14), Historic roadbed samples (Feature 23).

Note: Some excavation units, such as the backhoe trenches and their extensions, cut across or went down through several layers of varying disturbances. Samples from these units were divided according to their internal proveniences. For example, samples from the historic muck ditches in Backhoe Trenches 1 and 2 received medium priority. Levee overburden samples from the levee transect units received low priority, while undisturbed midden deposits from those same units receives high priority. Surface collections, by their nature, do not include any fine screened materials.

METHODOLOGICAL ASSESSMENT

The flexible field recovery strategy combining judgmental and statistical sampling excavations, hand and mechanical excavation, and dirt processing via water recovery methods proved effective in dealing with the variety of archeological data and contexts found at Cedar Grove. These techniques and a labor intensive work schedule yielded accurate and rapid data recovery within the constraints of the project. Laboratory methods conserved recovered data in basic analysis categories that facilitated quantitative and qualitative assessment for specialist analyses.

Mechanical equipment took care of overburden removal and stratigraphic trenching, while hand excavations recovered the associational details of complex features such as aboriginal burials. Waterscreening of large volumes of dirt gathered sizable artifact samples from judgmentally placed 2 m and 3 m square excavation units, while column samples statistically collected an unbiased sample of midden. The variety of screen sizes maintained controls on the smaller kinds and sizes of debris that could not be collected from all excavations due to time constraints. Flotation was done for all important feature proveniences. The field equipment included materials necessary for any kind of known chronometric sample that might have been encountered. Special samples (dog burials) that required more extensive conservation than could be afforded in the field were removed in blocks for laboratory stabilization and dissection.

The field and laboratory strategies were successful in recovering the full range of recognized data at Cedar Grove. This success was a result of preexcavation planning which included consultation with a variety of specialists, most of whom subsequently participated in the data analyses. The interdisciplinary approach to planning assured that the Cedar Grove excavations were a state-of-the-art archeological investigation done under the constraints of salvage conditions. These constraints directed attention to the Caddo IV/V occupation remains that would be destroyed by revetment construction in the direct impact zone at the expense of research on the Caddo III component and the rest of the Caddo IV/V occupation in the indirect impact zone. These remains, however, remain for future research. Restriction of the project right-of-way limits and previous destruction of a portion of the site by construction and natural erosion precluded definition of the total site limits or any of its components through this project. However, the Cedar Grove methodology recovered a rich data base, making the project exemplary not only as a cultural resource management mitigation excavation, but in any archeological technique perspective.

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Chapter 8

HISTORICAL ARCHEOLOGY

by Neal L.Trubowitz

Both archeological features and artifacts confirmed the basic documentary and oral evidence of the nature of the site use in the nineteenth and twentieth centuries before it was buried. A cemetery lay on the west side of a dirt road, on whose opposite side cultivated fields had stood. Between the roadbed and cemetery was an older levee (Figure 8-1).

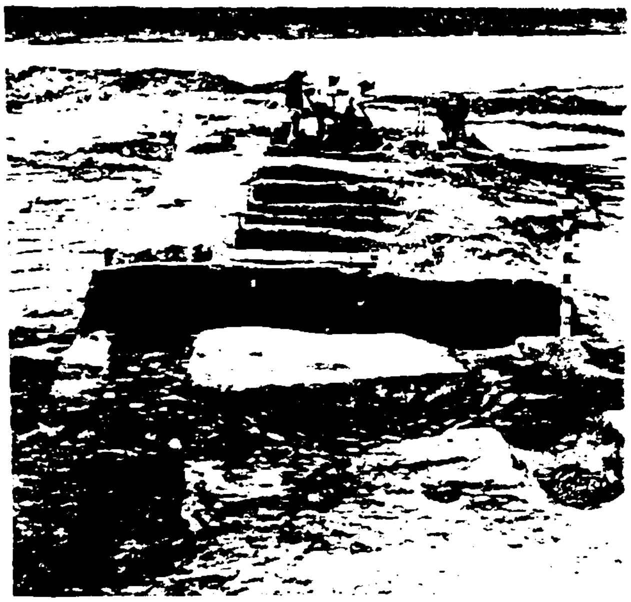

Figure 8-1. Historic levee with cemetery to left (west) and roadbed to right (east), looking north. Note marked graves and excavated levee muck ditches (AAS negative number 807949)

FEATURES

Feature numbers were assigned in order of their discovery, and as the west muck ditch of the historic levee had been found first during the June testing, it was designated as Feature 1. The overall levee was designated Feature 2, with the east muck ditch as Feature 22 and the historic road numbered Feature 23. Historic burials were numbered individually in a separate series (HB 1-128).

The Levee (Feature 2)

The levee appears to be the oldest historic feature on the site, as shown by the presence of road ruts on its eastern flank, and the intrusion of the most easterly rows of historic graves on its western flank (Historic Burials 11, 22-23, 29 and 39-45 all clearly cut into the levee, Figure 7-15 and 8-2).

The levee had been built on the highest portion of the site rise, probably to heighten the elevation for flood protection of an individual field. It trended from southwest to northeast at an angle of 2[illegible]° east of the site grid north (Figure 7-15) or about 42° east of magnetic north. Its construction technique showed in profile (Figures 8-1 and 8-3). First two muck ditches or keyways had been dug into the ground. These ditches ran parallel to the length of the levee on its east and west sides. They served as anchors to keep floodwaters from sweeping away the piled up overburden of the *levee* mound. *Water had been puddled* into the muck ditches while they were being filled, and it

Figure 8-2. Mottled grave shafts of historical burials 39 and 40 cut through the dark deposits in the west muck ditch, *looking north* (AAS negative number 808008)

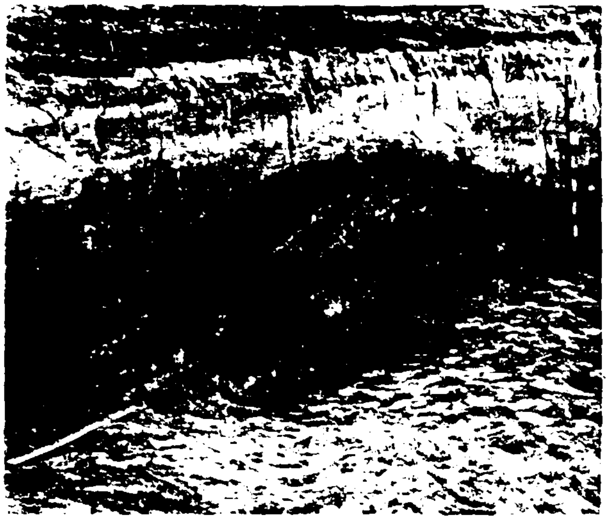

Figure 8-3. Buried levee profile in the indirect impact zone, looking northeast (AAS negative number 808021)

had gradually been tightly packed, forming a very dark brown (Munsell soil color 7.5 YR 3/2) compact deposit. Since the surrounding area consisted of the Caddo archeological site, the levee builders had incorporated it into the levee, and the muck ditches contained concentrated aboriginal remains with the character of a classic artifact rich midden. The puddling showed as thin (a few millimeters wide) bands of white sand layered with the darker midden soil.

In cross section the muck ditches were approximately .8 to 1.0 m wide at the top, narrowing at the base to about half a meter in width (Figure 8-4). The interval between the muck ditches underneath the levee varied between 2 and 2.5 m.

After the muck ditches were completed, additional soil from the immediate area had been piled on top of the fill, forming a mound above the muck ditches. The piled dirt had been placed there by hand and possibly with slip scoops drawn by mules, as there was no evidence of heavy machinery tracks, tires, or large machine bucket cuts. The levee overburden fill resembled basket loading (see Schambach et al. 1982). This, in combination with its aboriginal midden content, briefly led us to think during the initial testing in 19[illegible] that the levee overburden was part of an aboriginal mound.

In the direct impact zone it appeared that the levee overburden was either not mounded as high as it was farther south, or else it had been worn down by road and cemetery traffic (compare Figures 8-3 and 8-4). The reopening of E-W Trench 3 in the indirect impact zone provided a full profile of the levee at its maximum height with the muck ditches below. In this profile the levee overburden was .65 m above the top of the muck ditches, making a total height 1.2 m from the bottom of the west muck ditch to the top of the levee. The top of the levee was capped with a thin clay lens several centimeters thick which may represent a humus deposit. Sand lenses on both the west and east flanks of the levee may show rain washing down the slopes and sorting sand out during the construction, or else may represent conscious puddling of the deposits as was found in the muck ditches. As with the profile revealed during the summer testing in E-W Trench 4, the overburden consisted of mixed lenses and pockets of soil from the surrounding area, containing aboriginal material. The top of the highest point on the levee was buried .58 m below the present land surface, while the lower portions of the levee surface on the west flank were 1.15 m below the surface.

The Roadbed (Feature 23)

Feature 23 first appeared in the profile of [illegible] m squares [illegible] and [illegible] and then again in Hacknoe Trenches 1 and 2 (Figures 8-2, 8-4, and 8-5). It showed as thin narrow ruts in floor plan in square [illegible] E.5, and during the final stripping of the site overburden it appeared as a hardpacked layer running across the site, parallel to the historic levee at an angle of 42° east of north. This corresponds exactly with the orientation of the roadbed shown on the 1915 map of the area (Figure 8-1); there is no doubt that the map road and the archeological feature are one and the same.

As noted above, ruts from the road also ran onto the east edge of the levee, where they showed as lighter colored linear stains, convex in profile, against the darker levee overburden. The ruts seemed to occur in pairs, probably representing ruts on either side of the road from vehicles of [illegible] axle length, or else ruts cut from varying [illegible] conditions (Figure 8-5). The ruts ranged in size from the smaller fresher ruts (which looked like postmolds in profile) about .06 m in width, to older more worn ruts having a broader basin profile of about .2 m in width. There was, however, no confusing these cross sectioned features with aboriginal ones, for in floor plan their linear

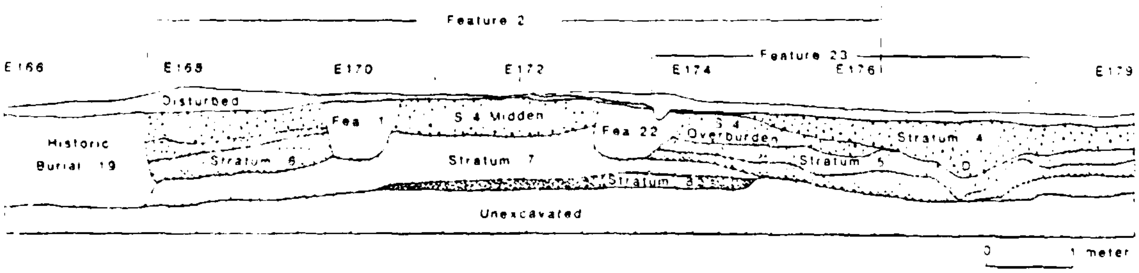

Figure 8-4. North profile of Hacknoe Trench 1 across the historic levee and roadbed. Feature 1: west muck ditch; Feature 2: levee; Feature 22: east muck ditch; Feature 23: roadbed; S4 midden: undisturbed Caddo IV/V component; S4 overburden: Caddo IV/V midden disturbed by levee and road construction.

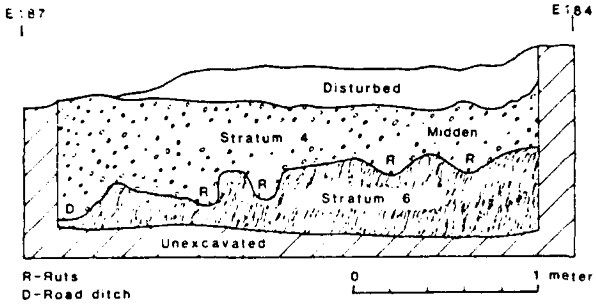

Figure 8-5. South profile of S54 E184 across the historic roadbed

nature trending along the roadbed was unmistakable. The narrow width of the ruts in general is expected, given that both gas powered and horse drawn vehicles of the early twentieth century had narrow tires and wheels. On the east side of the roadbed there may have been a drainage ditch, which showed in profile in the east and south walls of S54 E184 as a deeper and broader basin (Figure 8-5) which contained historic trash including unidentifiable rusted metal scraps.

The Cultivated Field

East of the roadbed floor plan, plow scars and undulating profiles in both 3 m square excavation units (Figure 8-6) and Backhoe Trench 1 showed that the area had been cultivated before its burial by the 1927 flood; again these data agreed with the 1925 map of the area. In floor plan the plow scars trended from southwest to northeast, once again paralleling the historic roadbed and levee.

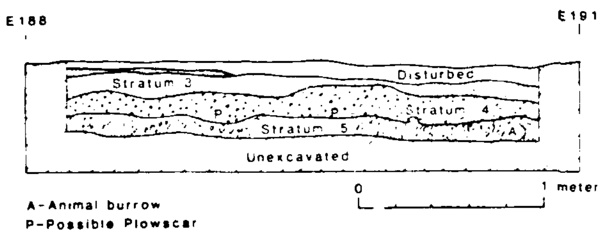

Figure 8-6. North profile of S75.5 E188

The Historic Cemetery

During the testing phase of the research at Cedar Grove no evidence of historic graves outside of the north end of the direct impact zone was recognized. At that time the construction had revealed the tombstones of Mary Mitchell (HB 9), Lue Powell (HB 8), J. D. Richards (HB 7) (probably mislabeled J. B. Richard), and Minnie Wilkerson (HB 6), in addition to the stone of H. J. Jackson, which had fallen into the river due to erosion. During testing five grave shafts of unidentified individuals were located besides the four marked graves, bringing the total to nine graves found. What later turned out to be Historic Burials 116 and 119 were seen in the indirect impact zone when the east-west trench was opened, but they were then considered to be potential aboriginal graves, as they fell within Caddo Structure 1 (Feature 3) and as on other Caddo sites, such as Belcher (Webb 1959), Indian graves had been found in rectangular pits under similar circumstances.

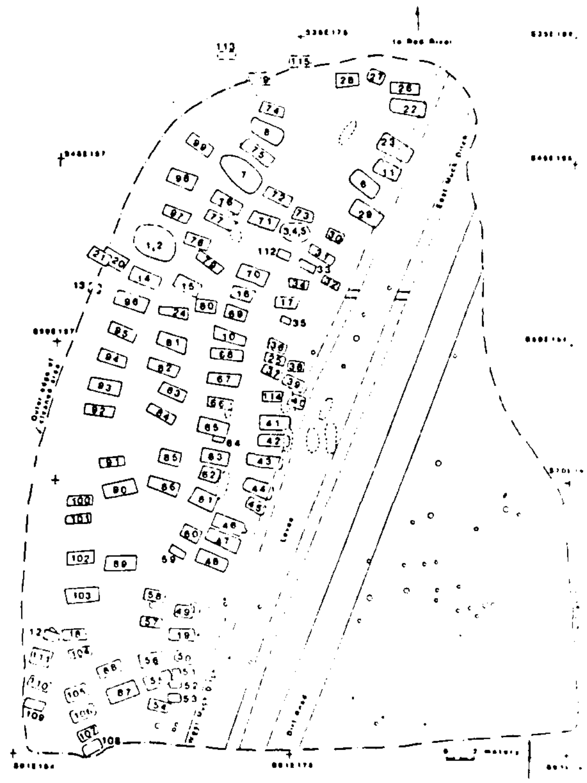

Figure 8-7. Historic burials in the direct impact zone

Between the testing and excavation phases of research the Red River Levee Board and the Cedar Grove Church sought to remove the identified graves for reburial in other local cemeteries. The four marked graves were moved with no identification problems, but it is not clear whether they accurately removed the graves identified as Historic Burials 1 through 5. It is certain that at least one burial (probably HB 1) was removed at the location of Historic Burials 1 and 2 (Figure 8-7), but later superimposition of the maps from the testing and excavation research shows that what was labeled as Historic Burial 78 after the final site stripping could have been the same grave as Historic Burial 2, indicating that it had not been removed. Similarly at least one grave (probably HB 5) was removed near Test Unit 5 where Historic Burials 3, 4, and 5 had been identified. Again superimposition of maps showed that HB 3 might be the same as HB 30, and HB 4 might be the same as HB 73. At most the grave removal took the four graves that were marked, one burial near Test Unit 5, and possibly two burials near Test Unit 2.

This coincidence of some of the graves was not noted until after the excavations were completed in the winter of 1980. During data recovery historic graves were numbered in order of their discovery as they were revealed in the backhoe trenches and small excavations (Historic Burials 11-27). This was after the first overburden stripping had revealed the fifth and final marked grave, that of a member of the Conner family, which was numbered as HB 10. After the final stripping revealed rows of historic graves in the direct impact zone, they were numbered roughly in those rows which ran southwest to northeast, from the east side of the cemetery to the west (Historic Burials 28 to 115). The final burials (HB 116-128) were identified during the hand excavations in the indirect impact zone (Figure 8-8). Between the work in Backhoe Trench 2 and the final site stripping there may

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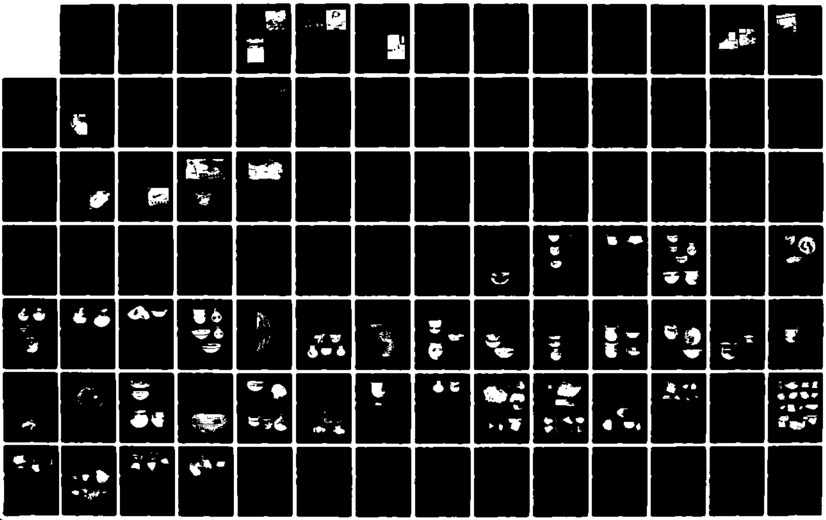

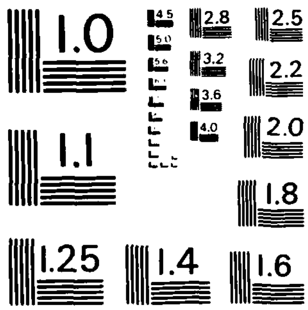

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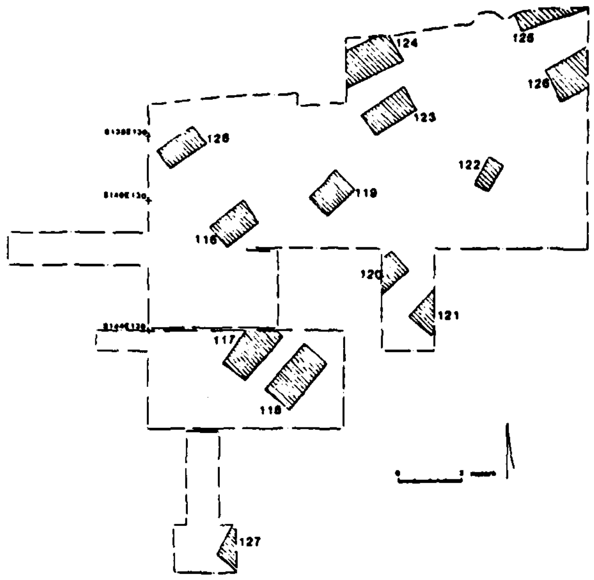

Figure 8-8. Historic burials in the indirect impact zone

have been a misidentification making HB 14 and 21 one and the same grave. Considering this possible overlap and those already noted, the actual number of historic graves identified in the ground represented no less than 124 and no more than 126 people. Thirteen of these graves were in the indirect impact zone and the rest were in the direct impact zone.

The historic grave shafts appeared against the surrounding soil surface as rectangular or square features with a mottled light colored fill (Figure 8-2). In profile they appeared as vertical shafts (Figures 8-2 and 8-4). Probing showed that the graves were oriented with the head at the west end of the grave, facing towards the levee and road to the east. Although the stripping made it impossible to exactly determine the original depths to which the grave shafts were dug, they appeared to go about 2 m below the surface for adult burials, with smaller children having shallower graves. This corresponds with the traditional or folklore concept of burying people "six feet deep." The horizontal dimensions of the grave shafts varied between minimum and maximum lengths of .9 to 2.6 m and minimum and maximum widths of .5 to 1.2 m. The mean or average length and width was 1.86 x .9 m (6.1 x 1.67 feet). The ratio of the length/width measurements was calculable for 101 of the graves, giving a range between .91 and 3.57, with the average or mean length/width ratio at 2.12; this showed that the grave shafts tended to be rectangular, averaging just over twice as long as broad.

Based on the low number of graves found during the June 1980 testing, and their coincidence with the majority of the marked historic burials, the discovery of over a hundred more during the data recovery must rank as the biggest surprise of the excavations, although their broad extent became apparent as soon as the backhoe trenches had been completed, hitting graves across the north-south expanse of the direct impact zone. They were also recognized immediately on the reopening of the indirect impact zone excavations. The historical records search in local repositories was begun by historian Beverly Watkins while the data recovery was underway, and it was then that she recognized and recorded the large cemetery area on the 1925 map of the site (Figure 6-3) in the possession of the landowner, Mr. Triplett. It was readily apparent that the documentary and archeological evidence corresponded in the orientation of the cemetery adjacent to a local dirt road.

The map dimensions showed the cemetery running for between ca 182-200 m along the road, with the width varying from a narrow ca 15 m at the north end to ca 30 m at the south end. In the direct impact zone excavations the width of the cemetery came to about 16 m within the area stripped for investigation of the aboriginal component. It is possible that additional historic graves might be located farther west than currently known, although it is expected that there would be few such graves in that direction, as the number of burials decreased on that side of the site. The indirect impact zone excavations opened a smaller areas that showed historic burials running east to west across at least a 13 m wide expanse.

Further delineation of the historic cemetery was not sought beyond that revealed in the field investigations of the aboriginal component, as that was outside the scope of services for the project. Our immediate responsibility to any historic graves that we encountered was to mark and map them, leaving them undisturbed, so far as they did not preclude investigation of the Caddo occupation. Removal of the historic graves was specifically not part of the contract for the aboriginal data recovery between the Corps and the Survey, and final arrangements for their exhumation were not completed until the summer of 1982 (Rose 1983).

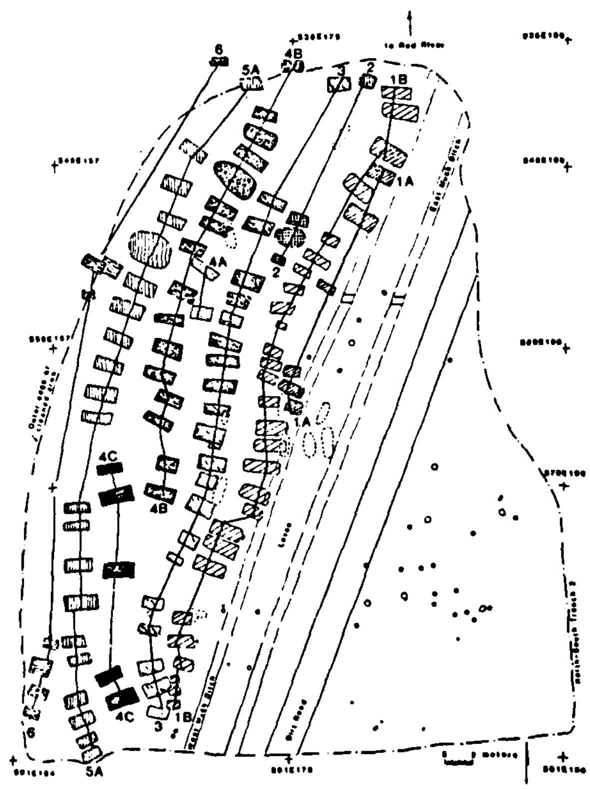

Figure 8-9. Historic grave rows in the direct impact zone

The historic graves were obviously oriented in rough rows parallel to the roadbed, although these rows sometimes seemed to blend or split apart (Figure 8-9 and 8-10). In the direct impact zone there were at least four major rows (numbers 1A/1B, 3, 4B, and 5A) with several smaller rows or single graves between larger rows (numbers 2, 4A, 4C, 5B, and 6). The larger rows had no fewer than 15 graves, while the most any of the smaller rows could be seen to have was six graves (row 6). In the indirect impact zone

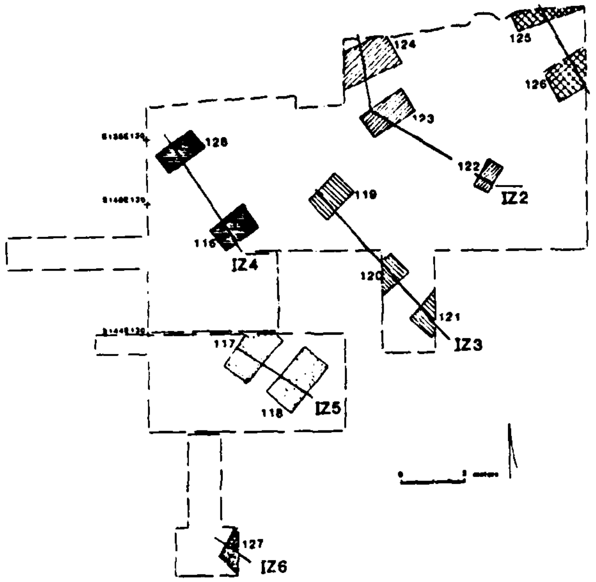

Figure 8-10. Historic grave rows in the indirect impact zone

there was evidence indicating as many as six possible rows, but there was not enough area exposed there to reveal more than three graves in any single row, or to match them with any assurance to those found in the direct impact zone.

Some speculation is possible concerning the total size of the cemetery population, even though its total dimensions have not been ascertained in the field. It seems likely that the newest part of the cemetery was at the north end, where the few marked graves were recovered. The progression of these graves in rows 4B and 5A may indicate this also, with the most recent date of death for Mary Mitchell (November 23, 1925) being the most northerly of the identified graves, followed by Lue Powell (September 4, 1919) and J. D. Richards (May 24, 1917) farther south in the next row over (Figure 8-9). Furthermore, there was an unused space between rows 1A/1B and row 4B that may have been left for future burials. If the cemetery had extended much farther to the north, it would seem likely that more than the Jackson tombstone would have been eroded away by the river while the construction crews were in the area. Local avocationalists Herschel and Dot Kitchens take regular boat trips along this portion of the Red River to inspect the sandbars and bank lines for eroding archeological remains, and they had not encountered skeletons or gravestones in their trips before the discovery of 3LA97 during the revetment construction. Thus, it is concluded that the graves found at the north end of the site probably correspond well with the northern limits of the historic cemetery at 3LA97, and the major portion of it still exists.

If the 1925 map is assumed to be an accurate picture of the dimensions of the cemetery, a conservative estimate of the area, using a 182 m length by 15 m width gives an area of about 2,787 m^2. An estimate of the average density of 1 grave for every 10 m^2 was obtained for the site by overlaying eight 10 m squares on the map of the burials in the direct impact zone, starting south of the newer part of the cemetery at the north end, which was not filled with its total capacity for graves. Counts were made for each of these eight squares, and the average number of burials was calculated at 10.5 burials per 100 m^2, which was then converted to the ratio of 1 grave for every 10 m^2. By dividing the total estimated cemetery area by this figure an estimate of 279 total burials is obtained for the entire cemetery.

Using the same ratio it was calculated that there should be about 64 burials in the area between the excavations in the indirect impact zone and the direct impact zone, 80 more burials to the south of the indirect impact zone and about nine undiscovered graves near those same excavations.

If the cemetery was started as early as 1834, during the first American settlement of the property, and its known termination of use is the 1927 flood, then the cemetery's maximum usage spans 93 years. Dividing the total number of projected burials by this time span gives an average mortality rate of 3.0 per year, which is slightly higher than figures projected by Watkins (Chapter 6). However, to shorten the time span of usage of the cemetery would greatly increase the mortality rate estimate. The local black population of the site area, both slave and free, has rarely exceeded 200 persons. Using negative evidence it is presumed that there have been no epidemics since 1834 (which would have increased mortality rates), other than the 1919 flu epidemic which was more prevalent in urban than rural areas. Therefore, it is concluded that the Cedar Grove cemetery is one of the first black cemeteries to have been established in this area, and it should date to the pre-Civil War era. It is the largest of any of the black cemeteries in the vicinity.

Cemetery Distribution in the Cedar Grove Vicinity

The Cedar Grove cemetery location is like the other cemeteries still in use by the Cedar Grove Church. The cemeteries are all located on donated land that was marginal to agricultural practices current at the time of their establishment. The Wright Cemetery lies on the filled in oxbow of the north end of Battle Lake. The other two cemetery locations are on the filled in portion of the north end of the Mays Lake oxbow and the edge of the oxbow on the lake's opposite end, closest to the Cedar Grove Church. The church is central to these burial locations, which may represent the immediate dispersed church cemetery limits. The Wright Cemetery is about 4 km by road from the church, while the Cedar Grove cemetery lies just under that distance in the opposite direction.

MATERIAL REMAINS AND HISTORIC ARTIFACTS

Although prehistorians often have no choice but to group their artifacts according to raw materials, working with historical debris has the advantage that many of the artifacts are of known use. At Cedar Grove identifiable items were found among the metal, glass, ceramic, and synthetic materials that were recovered (Appendix V) and of course the tombstones. Besides those materials that were identified there were 73 objects which could not be identified by visual inspection, and another five items that were of synthetic origins, but again could not be identified visually. Metal was the most common historic material found (410 items), followed by glass (138 pieces) and ceramics (only 16 artifacts). Identifications and dates were assigned by the author in consultation with Leslie Stewart-Abernathy. The historic materials indicate a nineteenth to early twentieth century occupation connected with the Cedar Grove cemetery, levee, roadbed, and cultivation.

Tombstones

The few tombstones that were found at Cedar Grove have been relocated at the Old Town Cemetery north of Lewisville in Lafayette County (Lue Powell) or the Mays

Lake Cemetery on the Doyle Smith place (Jackson, Mitchell, and Richard). No analysis of the tombstone materials has been made, but they were either granite or marble. Four of the stones were rectangular blocks with a beveled top face displaying the seal of the Supreme Royal Circle of Friends (Jackson, Mitchell, Richard, and Wilkerson, Figures 6-5, 6-6, 6-8 and 6-9). This design consists of a lion above an inverted triangle with the initials R., C., F., (Royal Circle of Friends) in the angles surrounding a central "09" that probably stands for a 1909 founding date for the society; these designs are present at other cemeteries (Beverly Watkins, personal communication). Mary Mitchell's stone has in addition the inscription "Supreme Circle of Friends of the World" surrounding the lion/triangle device. On the face of the stones the chapter number (Circle No. 2) and name (Cedar Grove) are given in addition to the name of the person and date of death.

Unfortunately most of the graves were unmarked, or else they had originally been identified with wooden or other markers which have since deteriorated. However, no postmold or board stains were noted at the head of the burials without markers. The preponderance of unmarked graves may be typical as this was the case at the Wright Cemetery, one of the three extant Cedar Grove community burial grounds. There unmarked sunken pits show the locations of graves outnumbering those with an assortment of tombstones (Figure 8-11). The tombstones range from carved shafts like those found at Cedar Grove, to poured concrete in which the burial information has been inscribed (Figure 8-12).

This pattern of unmarked graves in the majority of cases, with a few concrete markers replacing stone shafts after the turn of the century is probably common in black cemeteries across the lowland areas of Arkansas. The pattern was found for the black community at Parkin in Cross County, Arkansas (Stewart-Abernathy, personal communication). These views of the Wright Cemetery present a time capsule view of how Cedar Grove must have looked before its burial by the 1927 flood. At the time of our visit to the Wright Cemetery (December 21, 1980), some of the brush had just been cleared away by burning, and a new grave had been recently dug. Some of the stones there are contemporary with those at Cedar Grove. The Royal Society motif on the Della Wilkerson stone at Wright Cemetery was identical to Minnie Wilkerson's stone and they were probably contemporary.

Figure 8-11. Unmarked sunken grave pits at the Wright Cemetery, Lafayette County, Arkansas (AAS negative number 815687)

Figure 8-12. Variety of marked graves at the Wright Cemetery, Lafayette County, Arkansas (AAS negative number 815681)

Lue Powell had a different headstone, a rectangular block that had been decorated and trimmed to resemble a column design surmounted with an arched cap of fallen leaves (Figure 6-7). Besides name and date of death, the age (64 years) was given, plus the inscription "Gone to a better land."

Footstones were also in use at Cedar Grove. One was found for Mary Mitchell (Schambach et al. 1982), and the only stone found with the Conner burial (Figure 6-4) was probably also a footstone. Evidence for a missing footstone--a square projection of the grave pit-- was found at Historic Burial 46 (Figure 8-7).

Metal

Almost half of the metal recovered was rusted iron which could not be identified. The majority of the recognizable metal artifacts were also iron, with two coins (see below), 10 pieces of brass, (8 ammunition, 1 button, and 1 tack) and seven pieces of lead (5 ammunition, 1 decorative coffin plate and 1 bale seal) as exceptions. The bale seal (Figure 8-13a) was 18 mm in diameter and had an inscription reading "RMECO." It was found in Levee Transect Unit 11. The lead coffin piece from Historic Burial 13 was a decorative molding around a fastener.

Iron Fasteners and Fencing. Nails and other fasteners were the most common metal artifact found. A total of 93 nails were found, all but two of which were wire nails, which would place their manufacture after 1830 (Stewart-Abernathy 1980:33). The other two nails were cut

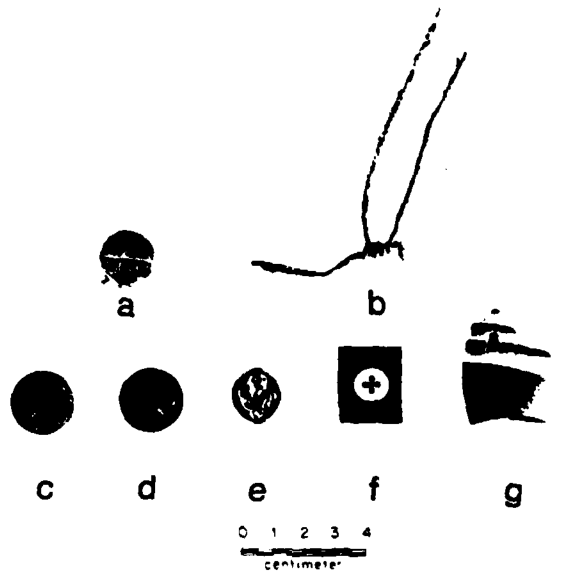

Figure 8-13. **Miscellaneous historic artifacts. a. *bale* seal; b. hogwire; c. 1889 Liberty nickel; d. 1900 Liberty nickel; e. brass button; f. porcelain button; g. banded annular mug fragment (AAS negative number 815677)**

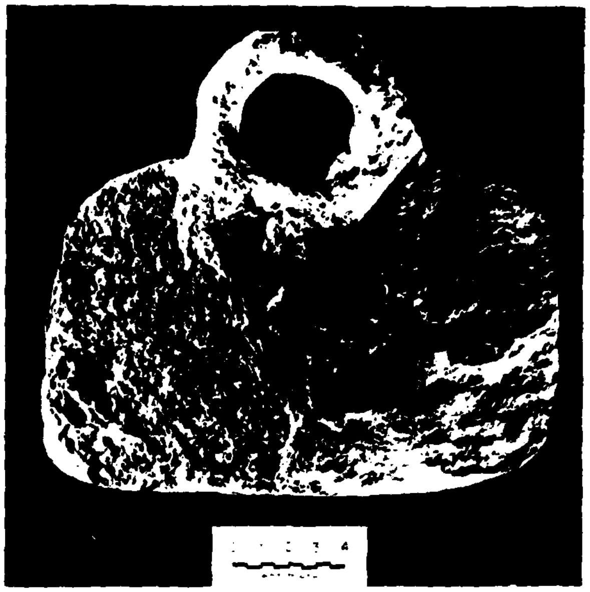

Figure 8-14. **Eye-socketed hoe blade found east of the levee (AAS negative number 815676)**

specimens, but the heads were too rusted for further identification. Five flathead screws (each 13 cm long) were found with 24 of the wire nails and five coffin lid thumb screws in the fill of *Historic Burial 42; these were probably* part of the coffin lid closure, from which the wood had since disintegrated. Of the 16 nails from Historic Burial 13 (which was partially destroyed by Backhoe Trench *2)*, some were still embedded in wood *from* the top of a coffin side panel. Ten other coffin lid thumbscrews were found in the cemetery area, other historic grave fill, and on the surface after the site was stripped.

Five fence staples were recovered along with numerous pieces of wire, including one piece that was identified as "hog wire" with a 76 cm mesh size. This piece (found just west of Levee *Transect Units 7 and 8 on the edge of the* cemetery) was .46 m long and included the top of the fence and the first horizontal level below it. Other fragments (Figure 8-13b) also showed the coiled *attachment of the* mesh to each horizontal element. One piece of four-pronged barbed wire was found in unit S79.27 E161. These wire fragments and fence staples indicate that at least portions of the historic cemetery were fenced, *although* it cannot be ascertained from the archeological debris whether there was a whole cemetery fence or just individual grave fences.

<u>Iron Hardware and Tools</u>. Some possible wagon hardware was found west of the levee during the stripping operations and at S53 E181 with a metal detector. Another piece of farm or construction machinery was found with the metal detector in the historic roadbed east of Levee Transect Units 12 and 13: this was a shackle with a screw closure. Several other artifacts may have been deposited during either construction of the levee and/or the roadbed. These included an eye socketed hoe (Figure 8-14) that took a *handle 5 cm in diameter;* it had a blade 18 cm wide. It was found in the backdirt after the stripping of the west side *of the levee. During* the *initial* site *stripping* a piece of chain was recovered at the south end of the levee in the direct impact zone. It had 5 cm long links which were 9 mm thick. It was recovered in two segments, just over a meter in total length.

<u>Iron Containers</u>. Two concentrations of thin iron fragments, one with 16 pieces and the other with 61, may represent two crushed tinned cans. The smaller concentration was found on the surface of the 1927 flood deposits in old E-W Trench 2 when the site stripping began, while the other can came from a column sample (S49.27 E159) within the larger excavation unit S48.77 E157. It may have been within an animal burrow.

<u>Ammunition</u>. A variety of firearm ammunition was found at Cedar Grove, including five shotgun shells or fragments, three bullet shells, and five pieces of lead which may represent spent bullets. These artifacts show hunting and/or target practice in the vicinity of the site, with the shotguns probably being used for waterfowl and small game, while the target(s) for the bullets are more difficult to specify.

Of the five shotgun shell fragments, one was a piece of the brass case, but the other four had identifying marks including one 16-gauge "UMC CO NEW CLUB," a 12-gauge "REM-UMC NITRO CLUB," a 12-gauge "UMC CO NEW CLUB," and a 12-gauge "WINCHESTER REPEATER." All of **these are from smokeless powder projectiles (hence the "nitro" designation) and postdate the Civil War. They were all found in levee overburden deposits in the direct impact zone around/or in the levee transect units.**

The bullet shells, all of brass, included a case marked "WRA 32 S & W," which stands for Winchester Repeating Arms, 32-caliber Smith & Wesson Revolver. Markings could not be made out if they were present on the other two shells. By measurements they were for a 22-caliber weapon and a 44-caliber gun. Again these artifacts represent post-Civil War weapons and they were found in levee overburden deposits (the .32 and .22) or west of the levee (the .44).

Of the five pieces of lead, only one can be designated as a blunted bullet with some certainty. This was a 38 caliber projectile that had splayed on impact with a solid object it could not penetrate. Of the other four pieces one may represent a .22 projectile, another a .30 projectile, and the other two are flattened into oblong shapes and cannot be measured for original diameter. None of these lead pieces could be sinkers as they are not grooved or drilled for line attachments. The two oblong pieces resemble pie crust weights used in baking; such an artifact is unlikely to be found outside of kitchen or kitchen midden deposit. The .22 lead piece was found in the fill of Historic Burial 42, the .30 piece was found on the east side of the levee after the midden was stripped, the .38 bullet was recovered in unit S79.27 E161, within the historic cemetery, and the two other pieces came from S57 E184 roadbed deposits and Feature 20 in the indirect impact zone.

Coins. Two Liberty "V" nickels were recovered. One minted in 1889 (Figure 8-13c) was recovered from the waterscreened levee overburden in Levee Transect Unit 11. The second coin, minted in 1900 (Figure 8-13d) was found with a metal detector 1.11 m west of Levee Transect Unit 10. These coins could have been lost by road travelers, cemetery visitors, workmen, farmhands, or grave diggers.

Personal Artifacts

Two buttons and a pipe fragment were the only personal items recovered in the excavations. The face of a two piece ladies brass button was recovered on the surface after the final stripping of the overburden. It had the face of a long haired woman, wearing a headband (Figure 8-13e). One other button was made out of porcelain (Figure 8-13f). It was similar to one found at Old Davidsonville (Stewart-Abernathy 1980:Figure 13j) in Randolph County, Arkansas.

> Porcelain buttons of this type date after 1840. The button was made by pressing prepared clay into a plaster of paris mold, drying, glazing, and then firing the button as with other porcelain items. This process for pressing was patented by Ricard Prosser in Birmingham, England, on June 17, 1840 (Stewart-Abernathy 1980:36).

Production of similar buttons was continued through the early 1900s when plastic buttons replaced them. Such buttons were common in the United States, although they have often been mistaken for opaque glass buttons (Stewart-Abernathy 1980:36-37). The Cedar Grove button was found in the levee overburden deposits in Levee Transect Unit 4.

The ceramic pipe fragment was recovered on the surface west of the levee after the stripping operations. It was from the rim of a kaolin pipe, and measured only 8.8 mm at its longest dimension along the circumference of the rim. Such pipes were common between 1800 and 1940 (Stewart-Abernathy, personal communication).

Ceramic Wares

Only 15 pieces of ceramics were recovered during the data recovery besides the porcelain button and pipe fragment. Only three of these were possible tablewares, a piece of undecorated whiteware found in the plowed midden deposit (Stratum 4) in unit S72.5 E185, another undecorated whiteware fragment found east of the levee on the surface after the final stripping, and a piece of a light blue banded annular ware mug (Figure 8-13g) found on the site surface also after stripping. Banded wares were popular between 1840 and 1900.

The rest of the ceramics were 11 stoneware sherds, all having an Albany (dark brown) slipped interior surface, though the exterior surface treatment varied. There were several sherds with a Bristol (cream colored) slipped exterior, which date between 1880 and 1900 for period of manufacture. These sherds were found in the initial stripping of the site, in waterscreened levee overburden deposits in Levee Transect Units 2 (two sherds) and 8, in column sample S80 E175 (0-10 cm), and in the backdirt west of the levee after the final stripping. Two sherds had salt-glazed exteriors; they were found during the initial stripping on the surface. One stoneware sherd had Albany slip on both surfaces, which was common between 1850 and 1900 (Stewart-Abernathy, personal communication). It was recovered in the levee overburden deposits in Levee Transect Unit 10. The surface on the last stoneware sherd (from Levee Transect Unit 5 overburden deposits) was defaced, and only the Albany slip interior was visible.

Glass

Of the 138 glass fragments recovered only five were flat pane glass while the rest were from containers or bottles. The flat pieces came from Backhoe Trench 2, which disturbed Historic Burial 13, a child burial. This plate glass probably either served as a cover for a photograph of the child or else actually permitted the face to be seen through the coffin lid. Placing photographs on coffins or tombstones under glass is still practiced in parts of the United States, though its greatest vogue may have been around the turn of the century.

One milk glass vase, broken into 43 fragments, was recovered from the Conner grave, Historic Burial 10. One other piece of milk glass, found in Levee Transect Unit 2 due east of the Conner grave, could be from the same vase.

Figure 8-15. Bottle fragments. a. pink tinted glass neck (ca 1880-1920); b. brown glass neck (ca 1840-1880); c. light green tinted glass bottle "Stamps Fuel and Ice Co." (ca 1892-1910?); d. light green tinted glass medicine vial neck (AAS negative number 815679)

Of the remaining glass, distributed mostly in small pieces in historic deposits (Appendix V), 64 pieces were clear (or lightly tinted green or pink) bottle glass, five pieces were green bottle glass, and 14 pieces were of brown bottle glass. Nine of the brown fragments came from one bottle and 17 of the clear fragments were also from a single bottle; both had the necks preserved. These represented two of the four bottle necks that were recovered.

One neck was clear, and lightly tinted pink (Figure 8-15a); it was found in the indirect impact zone when East-West Trench 4 was reopened. This neck once had a wire fastener to hold down a cork stopper. Such bottle fasteners date sometime between 1880 and 1920 in their period of manufacture. A similar bottle was found in a well at the historic tenant's house at the Toltec site (3LA42), near Scott, Arkansas (Stewart-Abernathy, personal communication). A bottle neck that had an earlier wire and cork stopper arrangement, dating between 1840 and 1880 in its period of manufacture, was found in the backdirt from the machine stripping of the west side of the levee. This bottle was made out of dark brown glass (Figure 8-15b). A bottle found just west of levee Transect Unit 6 had the most recent type of fastener, a crown cap, (Figure 8-15c). The invention of this bottle closure predated the invention of the automatic bottle machine in 1903; it was manufactured in a three piece plate bottom mold, with the crown cap formed by an "improved" lipping tool (Paul and Parmalee 1973) probably between 1892 and 1910 specifically for the "Stamps Ice and Fuel Co." whose label shows as embossed letters from the mold blowing on the light green tinted transparent bottle body, which has many trapped air bubbles. Stamps, Arkansas is approximately 32 km by road from the Cedar Grove site. The fourth bottle neck was from a light green tinted clear medicine vial (Figure 8-15d) which was found in the historic roadbed after the stripping. Such bottles are difficult to date as they were manufactured from the mideighteenth century through the last quarter of the nineteenth century (Stewart-Abernathy, personal communication).

Building Materials

Building materials are conspicuous by their absence at Cedar Grove. Only one brick fragment, weighing 118 g, was recovered just southeast of S141 E130 in the indirect impact zone. No other building materials were found and it is unlikely that a historic structure was present anywhere in the immediate vicinity of the excavations.

Synthetics

Seven artifacts were identified as synthetic materials, but only two were identified by visual inspection. These were pieces of foam or sponge rubber which were recovered from Features 16 and 20 in the indirect impact zone excavations. Feature 16 was a depression in the midden, but as it was within the historic cemetery the presence of historic debris is not unusual. Feature 20 was a burnt bone concentration which also could have been contaminated. Both of these features were given "feature" designations in the lab to denote some debris concentrations; they were not defined as features in the field as they were amorphous and exhibited no distinct floor plans or profiles.

EVALUATION OF THE HISTORIC ARTIFACTS

The artifactual debris, both in the types of materials recovered and their distribution, fit the pattern of the historic archeological features and documentary evidence for the use of Cedar Grove as a historic cemetery flanking a levee, roadbed, and cultivated field. Structural building materials and household midden debris were nonexistent.

Many of the metal artifacts indicate construction techniques of slip scooping on the levee, or else roadbuilding, and/or cultivation. The few vessel fragments found were predominately beverage or other liquid containers (stoneware and glass) which were associated with the construction activities, roadside debris, or picnic lunches that visitors to the cemetery might have brought with them. Pieces of barbed wire and hog mesh fencing probably guarded graves in the cemetery. Coffin nails, flathead screws, decorative thumbscrews, lead moldings, glass coffin plates and flower vase fragments are clearly related to cemetery use.

The few artifacts which could be identified as to probable time span of manufacture are predominately post-1840 to early 1900s. The two most specifically dated artifacts, the 1889 and 1900 coins, were found associated with the levee, but it is not clear whether they were deposited during construction activities or were lost by a later visitor to the site. These dated artifacts are consistent with the known history of the area, with cultivation underway by the 1840s, and the site being sealed by the floods of 1927-1930.

The distribution of historic artifacts (Appendix V), other than those directly associated with the historic graves, is predominately in the levee overburden, the historic roadbed, or in cultivated midden deposits. This distribution in combination with the kinds of historic debris recovered present firm evidence that the historic land use consisted of a levee with a cemetery on its west side and a roadbed separating it from cultivated fields to the east. Occasionally hunters or target shooters passed through the area, leaving a thin scatter of spent ammunition.

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Chapter 9

ABORIGINAL SETTLEMENT

by Neal L. Trubowitz

SITE LOCATION

A number of conclusions can be made concerning the landform that 3LA97 was located on during its aboriginal occupation. As noted in the test report (Schambach et al. 1982) the present locations of 3LA97 and 3LA128 on the Red River bank of Lester Bend is a recent phenomenon having occurred since the 1954 U.S. Geological Survey mapping of the area. When occupied, the sites were inside the bend, but not adjacent to the main river channel. The data recovery at 3LA97 and the test excavations at 3LA128 (Trubowitz et al. 1982) show that both sites were located on rises, which appear to be trending from southwest to northeast, roughly parallel to each other. Both rises were buried by flood deposits dating between 1927 and 1930; a 1930 aerial photograph of the 3LA97 and 3LA128 site areas (Schambach et al. 1982:Figure 6-4) clearly shows a crevasse-splay deposited when the river jumped its banks. As Hemmings (1982a:98) postulated, it is apparent that both aboriginal occupations *were located* on point bar ridges.

> Point bar deposits consist of sediments laid down on the insides of river bends as a result of meandering of the stream. Although the deposits extend to a depth equal to the deepest portion or thalweg of the parent stream, only the uppermost, fine grained portion is included as part of the topstratum. Within the point bar topstratum, there are two types of deposits: silty and sandy, elongate bar deposits or "ridges" that are laid down during high stages on the stream, and silty and clayey deposits in arcuate depression or "swales" that are laid down during falling river stages. Characteristically, the ridges and swales form an alternating series, the configuration of which conforms to the curvature of the migrating channel and indicates the direction and extent of meandering.
>
> Point bar deposits are widespread throughout the Red River Valley. These deposits occur inside meanders of the present Red River and its abandoned courses and channels (Smith and Russ 1974:Figure 3).

The relative positions and ages of the two sites support their locations as being on point bars. They are both on the open side of the bend which has steadily built up point bars from east to west along its axis; the earlier point bars lie on the east side of the bend. The ages of the different occupations correspond with this point bar progression, with the earlier occupations on the east and the later ones to the west. Site 3LA128, to the east, had a Caddo I and II occupation. The Caddo III occupation at Cedar Grove was between *3LA128 and the* Caddo IV/V portion of 3LA97, which are approximately 900-1,000 m apart. Later settlements could also occupy the earlier landforms (there was also a Caddo IV component at 3LA128), but no early Caddo remains could be expected to be found on the recent point bars, and this is the case. Another known late Caddo component, 3LA38/48 lies 400-500 m south of 3LA97; this site may occupy the same point bar rise and would thus be an extension of the Cedar Grove site.

Site midden profiles and elevations show that the sites are on similar landforms in a ridge and swale topography which conforms to the configuration of point bar deposits. Profiles of the elevations of the midden deposits across the two sites (Trubowitz et al. 1982; Schambach et al. 1982)

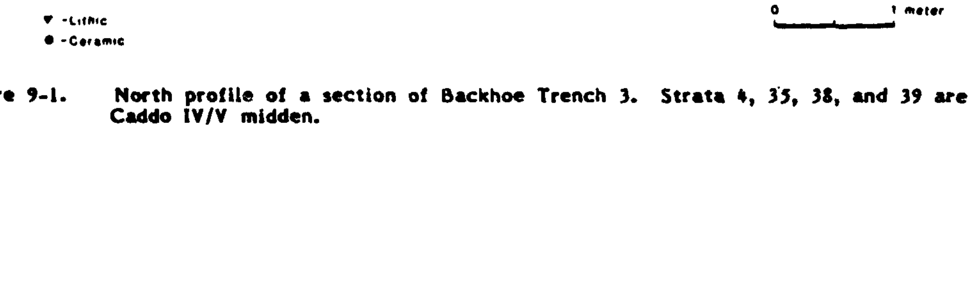

Figure 9-1. North profile of a section of Backhoe Trench 3. Strata 4, 35, 38, and 39 are Caddo IV/V midden.

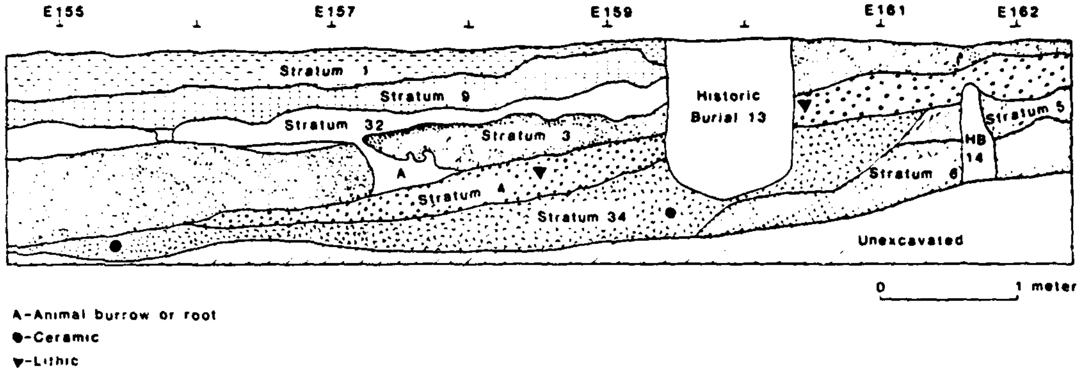

Figure 9-2. North profile of a section of Backhoe Trench 1. Strata 4 and 34 are Caddo IV/V midden.

show similar configurations, with the east sides of the rises tapering off more gradually than the west sides. The midden surface at 3LA97 was found at elevations between 68.2 m and 68.45 m amsl (224.09-224.52 feet), while the midden elevations at 3LA128 ranged between 68 and 69 m amsl (223.04-226.32 feet); the elevations at 3LA97 might be somewhat low because the historic levee construction removed much of the midden surface. Nevertheless, the midden elevations are considered to be consistent between the two sites. Both sites also sloped somewhat south along their long axes.

The stratigraphy of both sites shows fine grained sand deposits burying the slopes on the east and west sides of the sites. The continuous backhoe trenches on 3LA97 demonstrated how the flood deposits overlay the site, filling in the slough on the west side of the rise that had been occupied by the Caddo IV/V inhabitants (Figure 9-1 and 9-2). Various sloping deposits (Strata 4, 34, 35, 37, 38, 39, 40, Appendix VI) of sand and clay contained bits and pieces of aboriginal garbage. Stratum 4 appeared to be the main site midden that overlay the other deposits with artifacts in them. Toward the bottom of the profiles the artifact bearing deposits had higher clay content. Much of the clay had a bluish cast that comes from water saturated deposits. Excavation unit S48.77 E157, which was opened between Backhoe Trenches 2 and 3 specifically to test these sloping overbank midden deposits, showed this blue clay deposit contained midden trash, which had been thrown off the rise into standing water in the slough. These trench profiles reflected the stratigraphy that could be expected on point bar rise and swale topography.

> Point bar topstratum consists of red-brown silty sand, silt, silty clay, clay, and fine sand. Excluding the larger swales, the topstratum varies from 20 to 35 feet in thickness. Water and organic content are high in the swale deposits and are commonly low in the ridge deposits (Smith and Russ 1974:Figure 3).

Soil samples collected during the test excavations at 3LA97 were processed by the Soil Testing and Research Laboratory of the Agronomy Department of the University of Arkansas for soil pH, amount of organic debris (parts per million), phosphorous, potassium, and calcium (Appendix III). As expected those samples from swale deposits, Strata 30 and 31 in the Caddo III midden, contained higher levels of organic debris than the sands and silts on the point bar rises. Only the clay in the swales, midden deposits and the historic levee overburden and muck ditches, which incorporated midden deposits into them, showed organic debris levels higher than .5 parts per million. Stratum 9, a flood layer deposited somewhere between 1914 and 1927, was a clay lens with a high organic content also. This assessment and that by Hemmings (1982a) are confirmed by Guccione's analysis of sediment size variation (Chapter 3). Her analysis further emphasizes that deposits off the crest are those expected by deposition in a swale.

While in the field, different strata were assigned sequential numbers and letters as they were isolated. The first 31 numbers and letters A through J were assigned during the testing of 3LA97, while Strata 32 through 41 were numbered during the data recovery. Complete correlation of the different strata was not possible in the study time frame, but the excavations from both phases of the research were roughly matched by visual comparison of the various excavation profiles. Backhoe Trench 1 intersected N-S Trench 1 (Trubowitz 1982), so that Strata 3, 4, 5, 6, and 7 could be extended across most of the direct impact zone. Similar profiles in the other excavation units were then matched against those found in Backhoe Trench 1. Stratum 4 was the main midden bearing Caddo IV/V occupation deposit extending across the entire site, which in many places had been disturbed by land use. To this were added newly defined slope deposits with midden (Strata 34, 35, 37, 38, 39, 40) consisting of swale bank deposits into which trash was thrown. The Caddo III midden in old E-W Trench 3, Section 3 was concluded to be such an overbank garbage deposit for which the main occupation, on a separate rise or swell, was not identified; it is either east or west of the material found in Stratum 30.

Based on these data we may project a picture of Caddoan settlement location in the vicinity of Lester Bend (Figure 9-3). Farmsteads were located on fresh point bar ridges within the large meander bend. As the point bars built out, the settlements followed them. It is unlikely that such farmsteads would have been located on the active point bar, as it would have been subject to flooding, however, it would have been a convenient source of raw lithic cobbles needed for making tools. Sloughs between the point bars probably filled with water which was convenient to the farmsteads, even if they were located towards the axis of the river bend, away from the main channel bank erosion. Ceremonial centers were nearby, outside the active meander belt, adjacent to older abandoned river channels and oxbows.

One possible exception to this mound pattern was the McClure Place. C. B. Moore (1912) reported two mounds with two burials each; one was circular and the other was linear. This area has since been destroyed by the Red River. The Egypt site and its two mounds (3LA23) is less than 2 km away from 3LA97, about a half hour's walk. Battle Mound (3LA1), the largest known Caddoan mound, is about 5 km from 3LA97, an hour's walk away. Battle Mound probably had a landing site on the active channel of the Red River for canoe traffic, which would have made it even easier to get there. Other mound sites are recorded in the vicinity to the northeast and southeast (3LA15, 3LA132, and 3LA133) within easy walking distance of Lester Bend. At the Spirit Lake site, Hemmings (1982b:61) found

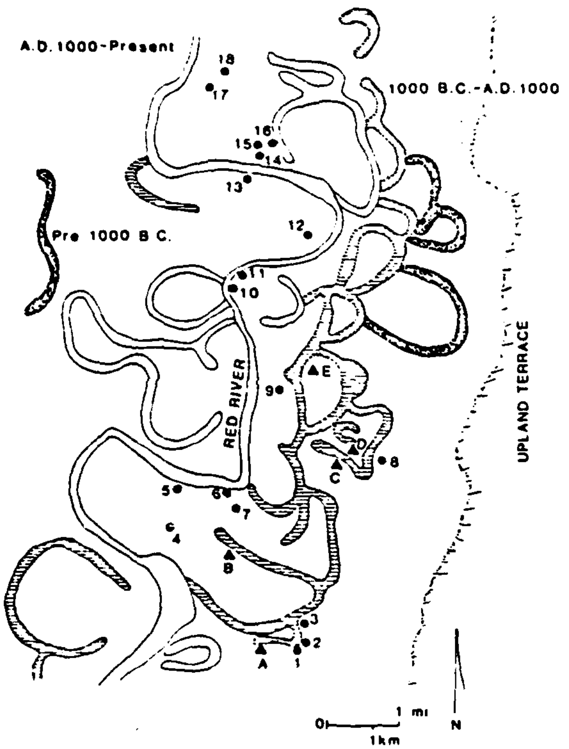

Figure 9-3. **Caddo sites in relation to meander belts in the Spirit Lake locality. Sites with mounds: A. 3LA15; B. 3LA23; C. 3LA132; D. 3LA133; E. 3LA 1. Other sites: 1. 3LA41; 2. 3LA135; 3. 3LA136; 4. 3LA38/48; 5. 3LA97; 6. 3LA128; 7. 3LA134; 8. 3LA131; 9. 3LA85; 10. 3LA89; 11. McClure Place; 12. 3MI35/3LA84; 13. 3MI45; 14. 3LA83; 15. 3LA87; 17. Joe Russell Place; 18. C. M. Shaw Place.**

a settlement arrangement similar to those of 3LA97 and 3LA128.

> Aerial photographs indicate that Spirit Lake and an adjacent small settlement, Gum Point, on the northwest were situated on low arcuate ridges, separated by swales. These ridges appear to be congruent with the old channel or oxbow lake just eastward, for which the Spirit Lake site is named. Therefore, these small settlements may have been placed on recent point bar ridges inside a meander and near its axis. Such a location would have been slightly elevated, favorable for drainage, and strategically remote from cutbank erosion.

These two sites are between 8 and 9 km north of 3LA97 up the Red River as the crow flies (15.5 km up by boat).

As noted by Pearson (1982) there can be no doubt that the Caddoan peoples who inhabited this region were familiar with the meander and flood patterns of the Red River and adjusted their settlements to avoid floods and erosion. Pearson stated that natural levees are the highest and best drained landforms, and therefore are assumed to have been the best sites for long term settlement. In his research he noted 17 Caddoan sites on Red River levees in the Great Bend region, one on the levee of a crevasse system, and one on a minor stream natural levee. He concluded that

> the most obvious choice for settlement in the alluvial valley would have been along the recently formed oxbow lakes adjacent to the active channel. Settlements along oxbow lakes were removed from the immediate danger of river activity and were located in areas providing the combined advantages of the high, well drained soils of relict levees and the abundant resources (especially fish) found in these lakes (Smith 1978:480-489). It is, therefore, argued that most of the major sites (e.g., mound sites) associated with relict Red River channels were established and occupied during that period when the channel was a productive oxbow lake (Pearson 1982:28).

Hemmings (1982b) also noted an association of some of the local Caddo sites (Battle Mound and Spirit Lake, 3LA83) with prairie openings. With his investigations at Spirit Lake and those at 3LA128 and 3LA97, point bar ridge habitations, a part of the overall Caddoan settlement system, have now been recognized. Due to their buried nature, such sites are probably underrepresented in current archeological site files, and our view of Caddoan settlement systems has been missing a vital part until now. While mound sites may have of necessity been farther away from active channels, as they were in use for relatively long periods of time, many of the actual Caddoan living sites, the basic subsistence farmsteads, were located on the point bars. This reflects a settlement system finely attuned to the potential resources offered by the local environment in the Great Bend Region.

SITE SETTLEMENT PATTERN

As used in this report, settlement pattern refers to the distribution of the various aboriginal features that were encountered at 3LA97. On the basis of the discovery of soil stains, some of which yielded artifactual debris, 16 aboriginal features (numbers 3-7, 9-19) were defined during the fieldwork. Feature 8 was concluded to be a tree root

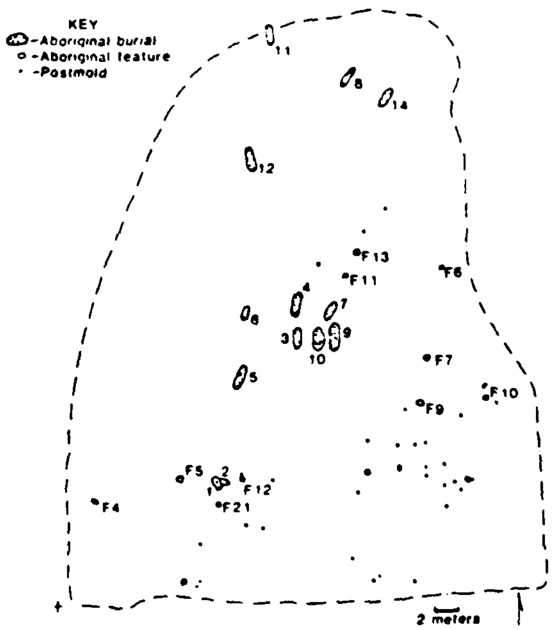

Figure 9-4. **Aboriginal features in the direct impact zone**

after cross sectioning and no further work was done with it. In the laboratory, feature numbers were assigned to five artifact concentrations for ease of reference (numbers 20, 21, 24, 25) which may represent aboriginal features. Feature numbers were assigned to one nearly complete and two potential aboriginal structures. Caddo Structure 1 was designated Feature 3, Structure 2 was assigned number 21, and Structure 3 was given number 25. In addition to the house structures, the features ranged from canine burials, undifferentiated pits or hearths, to house floor depressions. Besides these features aboriginal postmolds were designated in a separate series of numbers. Postmolds 1-5 were assigned during the testing research (Trubowitz 1982) while numbers 6 through 93 were assigned during the data recovery at 3LA97. The final subset of aboriginal features were assigned to features that were identified as human interments in the field (Burials 1-15). Summaries of the dimensions of the features and postmolds, their rough sort artifact contents and their distribution are provided in Appendix VI. Figures 9-4 and 9-5 show the distribution of the aboriginal features.

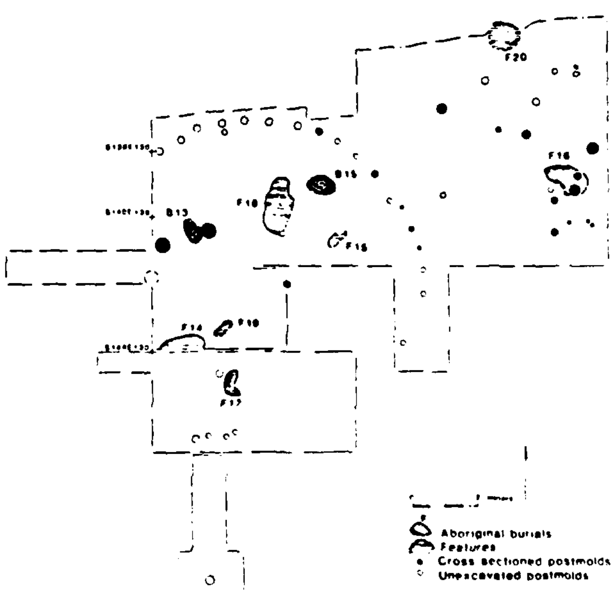

Figure 9-5. Aboriginal features in the indirect impact zone

Differentiation between the postmolds and other nonburial aboriginal features was at times arbitrary in the field. The tendency was to call soil stains that were small circles in floor plan postmolds, while larger less regularly shaped soil stains were designated as features. Even after cross sectioning the distinction was always not clear, and it is possible that a couple of the "features" may have been "postmolds," and the reverse is probably also true.

To provide a measure of the possibility of overlap in these two categories, the ratio of the maximum floor plan diameter divided by the maximum depth of the same feature or postmold was calculated for those soil stains which were cross sectioned and measured (Appendix VI). A summary table of these data (Table 9-1) shows that the features for the most part do exhibit greater mean diameters, and a slightly shallower mean depth than the postmolds, giving basin shaped profiles with wide mouths, as opposed to postmold profiles that are narrower and have parallel sides at the surface, which taper to blunted points (see below). The diameter/depth ratio shows a dichotomy between those soil stains designated as features or

Table 9-1. Feature and postmold size comparison

	Diameter (cm)			Diameter (cm)		
	N	$\bar{X}$	Range	N	$\bar{X}$	Range
Postmolds	89	19.42	10-45	57	26.96	8-70
Features	16	69.09	30-157	11	22.09	9-50

	Diameter/Depth Ratio								
				<1		1-1.99		>2	
	Total	$\bar{X}$	Range	N	%	N	%	N	%
Postmolds	57	1.01	.32-2.88	37	65	13	23	7	12
Features	11	3.98	.91-9.00	1	9	1	9	9	82

postmolds. The bulk of the postmolds have a ratio less than 1, indicating that they are deeper than they are wide, while the opposite holds for the features. Most profiles corroborate these ratios (Figure 9-6a-d). There is some overlap in the diameters of the postmolds and features which may indicate that Feature 5 could actually be a large postmold. Postmolds 5, 21, 30, 45, and 72 (Figure 9-6e) have diameters of 40 cm or greater, but only Postmolds 5 and 45 in this group have correspondingly high diameter/depth ratios of over 2.

Of course, these ratios must be qualified. Varying depth of midden across the site, differential excavation (particularly during the machine stripping), historic occupation disturbances, and variations in the visibility of the soil stains affected the depth at which the soil stains were recognized and defined. However, as soil stain definition was generally difficult across the site due to the sandy nature of both the midden and subsoil, and since the midden had to be completely removed before the stains were visible, these variations are not considered a hindrance to these simple descriptive statistics.

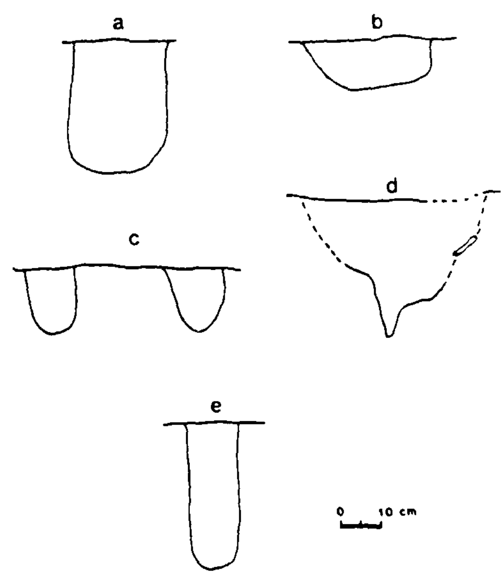

Figure 9-6. Examples of postmold profiles. a. Postmold 32, looking south; b. Postmold 33, looking south; c. Postmold 35 on left and Postmold 34, looking south; d. Postmold 73; e. Postmold 21, looking south

The method of assigning feature and postmold numbers inevitably meant that some of the soil stains eventually turned out to be natural rather than manmade. Feature 8 and Postmold 49 turned out to be plant roots after they were profiled; no further discussion will be offered for these stains. Actually there were few natural disturbances of aboriginal features at 3LA97. Roots may have penetrated Feature 13 and Postmold 21, but there was little sign of burrowing animals, which can wreck or complicate the interpretation of archeological features. The sandy nature of the soil was probably a deterrent to the construction of burrows, and the great depth of the twentieth century flood deposits may have been too deep for modern burrowing animals to have penetrated to the buried site level. However, Schambach and Miller consider some missing sherds in burials to be the result of animal activity.

The various features of site settlement pattern are discussed in the following order: small features, postmolds, structures, and human interments. This order was taken as the larger features, the Caddo structures, are composed of a variety of the other smaller soil stains, both postmolds and features.

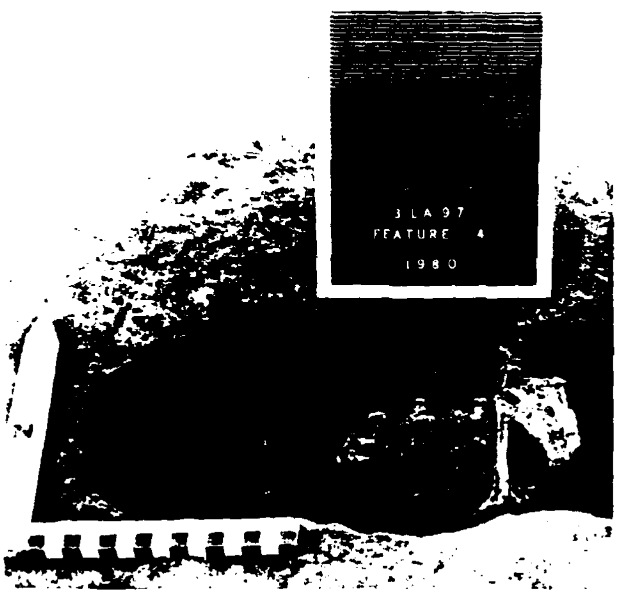

Figure 9-7. Feature 4 canine burial (AAS negative number 807939)

SMALL FEATURES

Two of the features, numbers 4 and 10, were identified as canine burials in the field. A third animal burial was labeled as Aboriginal Burial 2 in the field, but turned out to be the remains of a bald eagle upon specialist examination.

Feature 4 showed as a small articulated mammal skeleton (Figure 9-7) generally oriented in an east-west position. The digging of Historic Burial 12 had disturbed the south side of the feature and heavy machinery utilized in the stripping of the site midden had removed the mandible and some other post-cranial elements. The remaining bone was in poor condition. A single sherd was found resting on the ribs of the animal. No clear pit outline could be defined, so only the soil immediately around the skeleton was collected for flotation (17 liters).

Feature 10 was located on the opposite side of the historic levee from the other canine burial, in an area that had probably been cultivated (Figure 9-4). This skeleton was also found to be in a deteriorated condition, and it too had lost some of the cranial portion of the skeleton during the stripping operations. Once more no definite pit outline could be clearly defined (Figure 9-8), although a slight color difference between the soil around the bones (Munsell soil color 7.5 YR 3/4, dark brown) and the surrounding soil (Munsell soil color 7.5 YR 4/6, strong brown) may have indicated a roughly circular pit 54 cm in diameter along its east-west axis and 45 cm in diameter along its north-south axis. The head was oriented along with the body to the north. As with Feature 4, the animal apparently had been laid on its right side. The hindquarters of the animal had been tucked below its stomach. No obvious grave offerings or midden debris were found associated with this animal interment.

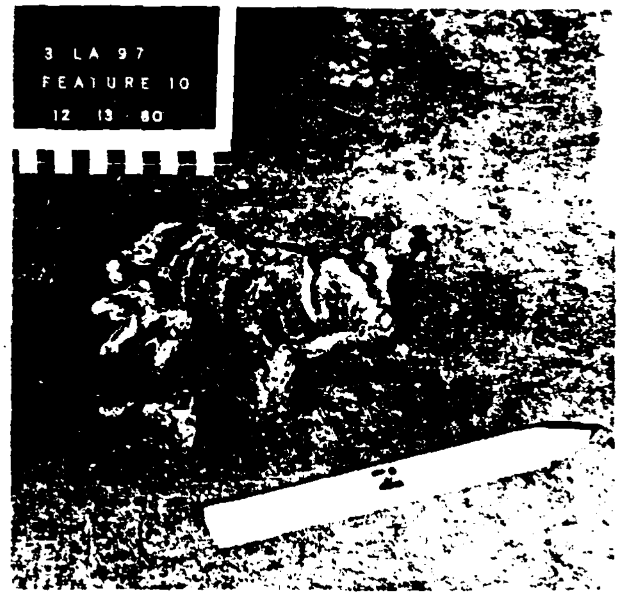

Figure 9-8. Feature 10 canine burial (AAS negative number 808003)

Aboriginal Burial 2 was, as already noted, first thought to be that of a human child, as it was adjacent to the human infant, Aboriginal Burial 1, and both were of similar size. The faunal analysis indicated that Aboriginal Burial 2 was a bald eagle (see Chapter 15). As no definite pit outline was discerned in the field, no clear separation between the two interments was observed. The heavy equipment used to strip the midden disturbed their upper levels probably mixing some of the broken materials between them. However, since the stripping disturbed both interments simultaneously, it appeared that they had also been dug at the same time and were associated. This association was further supported by the ceramic analysis that placed both graves in the same cultural phase assemblage (Chapter 11). The long axis of the eagle burial might have run roughtly north-south (as did the orientation of the infant burial), measuring 45 cm along that axis, and about 30 cm wide on the perpendicular.

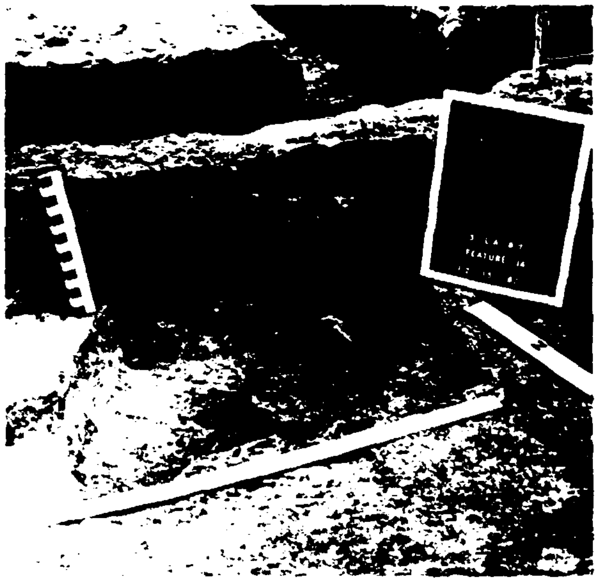

Figure 9-9. **Excavated Feature 14 within Caddo Structure 1 (Feature 3) (AAS negative number 808015)**

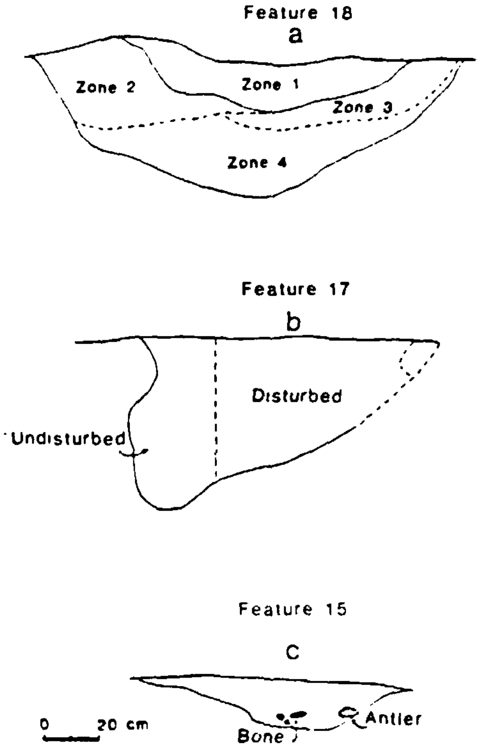

Figure 9-10. Examples of feature profiles within Caddo Structure 1 (Feature 3). a. Feature 18, hearth or baking pit, looking west; b. Feature 17, bell-shaped pit, looking west; c. Feature 15, floor depression, looking north

Most of the remaining small features defined during the excavations appear to be aboriginal constructions of various types. Presentations are organized by correlations with known and potential aboriginal structures and noted in the descriptions.

Feature 14 was within Caddo Structure 1 in the indirect impact zone. It consisted of a hard packed concentration of daub, charcoal bits, and other artifacts, including a possible sandstone abrader. The feature's maximum dimension was about 95 cm east to west and it was about 10cm deep (Figure 9-9).

Feature 15 was also within Caddo Structure 1. It was partially disturbed by Historic Burial 119 and may also have been hit by one of the temporary fence posts erected during the excavations to keep cattle out of the excavations. The stain was about 85 cm long, running roughly magnetic north to south. It was about 18 cm deep and contained daub, ceramics, lithics, and 144 g of animal remains, including burnt bone and antler. In floor plan the feature showed as an irregular dark stain, Munsell soil color 10 YR 3/2 very dark grayish brown, which had a gritty texture and was flecked with orange mottling. In profile (Figure 9-10c) the feature showed as a shallow basin tapering out on the edges.

Feature 16 was a depression in the midden outside Caddo structure 1 in the indirect impact zone (Figure 9-5). After excavation postmolds 55, 56, and 57 were revealed below this irregularly shaped feature, which was about 1.4 m long in its greatest dimension. No depth measurement was taken. The feature contained 26 sherds, one piece of daub, 7 flakes, 7 g of animal remains and a piece of foam or sponge rubber, which may have been intrusive from the historic component.

Feature 17. Within Caddo Structure 1 in the indirect impact zone was a unique bell shaped pit, one half of which was destroyed by Historic Burial 117. This precluded the drawing of an accurate profile for the entire feature and getting a good estimate of its total size, but the profile of the surviving feature wall clearly showed the bell shape (Figure 9-10b). It was evident that the feature had been lined with charred cane, and it yielded a large pottery sample, a great deal of daub, including the largest chunks found on the site, a variety of lithics from unmodified materials to debitage, and both floral and faunal remains. Three sherds with shell temper were sent for thermoluminescense dating and a radiocarbon date from charred wood was processed (Chapter 17). The feature was probably .75 m in diameter and it was at least .5 m deep.

Feature 18. This feature was within the circle of posts of Caddo Structure 1, more to the north side of the structure than in the middle. It was the only feature that showed any evidence of burning inside the circle of postmolds that defined the structure. Large amounts of artifactual, floral, and faunal debris were recovered from this feature. More daub was found in it than any other feature, along with the most chipped stone artifacts. The feature was an irregular oval in shape, 1.57 m long, 1 m wide and .5 m deep. Postmold 71, originally defined separately, was found on cross sectioning to be part of Feature 18.

The feature had four deposition zones in profile (Figure 9-10a). Zone 1 was heavily loaded with daub. Zones 2 and 3 were the ones in which there appeared to have been thermal alteration, with a great deal of raw clay that had been baked. A heat shattered projectile point (a Scallorn arrowhead) with most of its potlid fractures still together, was found at the base of these levels, from which a suite of nine archeomagnetic samples were removed; one cube

later could not be utilized. Three shell tempered sherds found in this feature were submitted for thermoluminescense dating. Three radiocarbon samples were removed from the feature: one solid wood charcoal from the upper daub laden portion of the feature, one from the basal level, which was floated in the lab, and the last sample, a mixture of wood, cane and nut shell. Two of these three radiocarbon samples were dated. Daniel Wolfman summarizes the results in Chapter 17.

Schambach noted in his field notes for the excavation of Feature 18 a possible interpretation of the pit.

> There is a reference in Griffith (1954) to the Hasinai carrying "hot coals" into their houses for heat at night. That is a possibility here.
>
> There are frequent references in the archeological literature to daub being concentrated around fireplaces in houses. This is generally interpreted as daub that fell down from daub covered smoke holes or baffles around the fires (even though the ethnographic literature says Caddo houses had no smoke holes). Perhaps this daub was really the residue of hot daub cooking or heating (Schambach, AAS field notes).

Some other artifacts from this feature pose an unsolved puzzle. These were 57 pieces of a material that appeared to be part daub and partly a pumicelike material. It is packed with numerous gas bubble chambers that make the fragments light in weight. The daub and pumicelike material grade into each other on some pieces. This material might be refuse scoriae that were incorporated in the clay daub. Scoriae have been found on Plains archeological sites, and it is thought to have been used as an abrasive by the Indians (Marvin Kay, personal communication). On the other hand, some stray metal ore might have been random inclusions in the clay for the daub, which then reacted under the intense heat generated in the feature, forming material that looks like ore refuse.

Feature 19 was an irregularly shaped depression similar to Feature 15, within Caddo Structure 1 (Figure 9-5). It was oriented along the same axis as Feature 15. No depth measurement was taken, but it was about 54 cm long. A flotation sample of 14 liters from the feature produced 17 pieces of daub.

Feature 20 was the only feature that showed ash deposits indicative of burning on the spot. This feature was not identified as such in the field, but was given its own field serial number to reference concentration of burned bone and other artifacts that was northeast of Caddo Structure 1 (Figure 9-5). The feature contents included sherds, daub, some stone artifacts, and animal bone. It was approximately circular, about a meter in diameter. This feature might possibly have been the source of the heated daub found in Feature 18; 120 g of unfired clay were found in association with Feature 20. However, some historic debris was also found in this artifact concentration, which may indicate either that it is a contaminated aboriginal feature, or else a historic feature that incorporated the aboriginal midden, just as the historic levee had done. These historic remains included a piece of lead (possibly a bullet) and a piece of foam or sponge rubber.

Feature 5 was an elliptical stain in floor plan with a maximum diameter of 32 cm and a maximum depth of 35 cm. The feature might have been within a Caddo structure (Caddo Structure 2, Feature 24, see below). The fill consisted of midden mixed with sands and clay, Munsell color 7.5 YR 3/4, dark brown. In profile, the feature had cylindrical sides and a mildly rounded convex bottom (Figure 9-11a). No flotation sample was collected from this feature. Only two sherds and 2 g of animal remains were found in the feature.

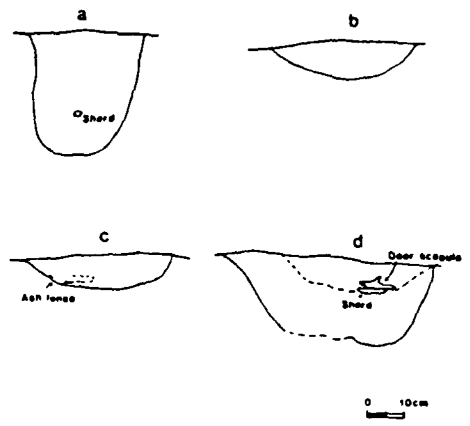

Figure 9-11. Examples of undifferentiated feature profiles. a. Feature 5, looking east; b. Feature 7, looking southeast; c. Feature 9, looking southeast; d. Feature 13, looking north

Feature 7 was in the cultivated area east of the historic roadbed in the direct impact zone northeast of Caddo Structure 2 (Figure 9-4). It was a shallow basin shaped pit with a maximum diameter of 40 cm and a maximum depth below the discovery surface of 10 cm (Figure 9-11b). Half the feature was floated, giving a projected total volume of 88 liters. Only a couple of sherds, a half dozen flakes and a gram of animal remains have been identified in the materials collected from the feature. The fill consisted of mixed clay and sand, flecked with tiny bits of charcoal, with an overall feature fill color of Munsell soil color 7.5 YR 4.5/4, strong brown.

Feature 9 was another shallow basin shaped pit, northeast of Caddo Structure 2 and south of Feature 7. It maximum diameter was 46.2 cm, and had a maximum depth of 9 cm. It consisted of mixed clays with charcoal, ceramics, lithics, daub, and bone and shell bits scattered through the feature. A small gray ash mottled lens about 3 cm thick, was found ca 6 cm below the surface of the feature (Figure 9-11c). Half the feature was floated, yielding a total volume projection of 16 liters. The Munsell soil color of the feature was 7.5 YR 4/6, strong brown.

Feature 12 was 2 m east of Aboriginal Burial 1 (Figure 9-4); it may have been within a possible Caddo house, designated Caddo Structure 2. The maximum horizontal dimension was 35.3 cm east-west and its maximum depth was 14.5 cm. Total volume of the feature, projected from one half of it removed for flotation, was 10 liters. No identifiable macroremains were found in the flotation sample. Feature 12 intersected Postmold 38. It could be an animal burrow as it was irregular in both profile and floor plan. It was also intersected by the west muck ditch (Feature 1) of the historic levee and was partially destroyed, making it difficult to interpret the nature of this feature. The feature fill was Munsell soil color 7.5 YR 4/4, brown/dark brown.

Feature 21. This feature designation was assigned in the lab to a concentration of material noted about 2 m south of Aboriginal Burial 1 in the direct impact zone (Figure 9-4). This could have been an area that had contained an aboriginal house, Caddo Structure 2. The excavator only noted that it was a roughly circular organic stain or rodent burrow; no floor plan or profile was drawn. No flotation sample was collected, but four sherds and 32 g of animal remains were handpicked from the stain.

Feature 6 was immediately east of the historic roadbed in the direct impact zone, a little south and east of Caddo Structure 3 (Figure 9-4). Half of the feature was floated but no profile was drawn of the feature. It yielded sherds, a piece of chipped stone, flakes, and small amounts of floral and faunal material. It was approximately 30 cm in diameter.

Feature 11. Beneath the levee in Levee Transect Unit 3 a possible cache of deer bone was found. The bones were oriented almost vertically as if they were in a pit (Figure 9-12) even though no pit outline could be discerned. One small bone at the bottom of the cache was split but the others were whole. More animal bone by weight came out of this feature than any other one. It also contained the third greatest concentration of daub for any feature, a half dozen sherds, a few pieces of lithic material, and 4 g of floral remains. The feature was 40 cm in maximum diameter and 17.5 cm deep. It could have been within a postulated Caddo house (Caddo Structure 3).

Feature 13 was not recognized until approximately half of it had been removed. While clearing the floor of Levee Transect Unit 2 the excavators hit a large piece of mammal bone (probably deer), they then cleared the surrounding area, discovering the outline of the pit by the color of the soil and its texture; within the feature the sandy soil was darker (Munsell soil color 7.5 YR 3/4 dark brown) and less compact. A deer scapula and several large sherds were grouped together about halfway through the profile of the pit, which showed a basin shape (Figure 9-11c). The pit was about 20 cm deep and 57 cm in diameter in floor plan. A root had cut through the west side of the feature, and had acquired feature fill after it decayed. Flakes were found besides the sherds and animal bone. The pit could have been a feature inside Caddo Structure 3.

Figure 9-12. Feature 11, animal bone cache (AAS negative number 807964)

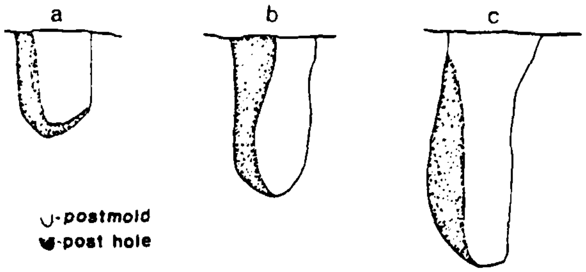

Figure 9-13. **West profiles of postmolds showing the postmold within a posthole stain. a. Postmold 26; b. Postmold 66; c. Postmold 69**

POSTMOLDS

While all postmolds and features within the direct impact zone were cross sectioned, time constraints did not permit the checking of those in the indirect impact zone excavations. However, those soil stains have been reburied and remain for future investigation if any additional research is ever undertaken at 3LA97.

Several of the postmold profiles pointed out an important distinction that must be made between the soil stains found representing posts, and the actual size of the decayed posts that were once set into the ground at these postmolds loci. In Postmolds 26 (indirect impact zone), 66, and 69 (both part of Caddo Structure 1) the postmold stain could be separated into two parts, a stain that represented the decayed post, and a stain represented part of a hole that had been excavated to place the post into the ground (Figure 9-13a-c). Thus, the postmold measurements made on 3LA97 represent post hole sizes for the most part rather than the size of the actual posts, which could not be distinguished in the majority of the postmolds. The actual post diameters in the three stains with postmold versus posthole distinctions were: Postmold 26, 13 cm; Postmold 66, 9-11 cm; Postmold 69, 11-20 cm.

It is noted that because of the difficulty of distinguishing small soil stains against the sandy subsoil, it is possible that extant postmolds were not recognizable at Cedar Grove. Nevertheless, the presence of features across both the direct and indirect impact zones would seem to indicate that the search techniques utilized were successful in locating the majority of the features distinguishable by such methods.

Historic disturbances of the site clearly destroyed much of the potential of 3LA97 to reveal internal settlement patterning through the tracing of postmold lines. Only in the indirect impact zone excavations, where the historic graves were not clustered as closely (Figure 9-14) did a clear pattern survive, showing the curve of a circular wall line for Caddo Structure 1 (Feature 3). There, Postmolds 61-69, and 84-92 formed an arc 13.2 m in circumference. By projecting the curve of this arc it became almost certain that Postmolds 79A, 80, 81, and 82 were the other side of a circular structure. According to the Teran-Soule model, circular structures for houses or storage were the form utilized by the Caddo when they were contacted by Europeans. Further discussion of this particular structure follows below.

The Teran-Soule model and the dimensions of the postmolds within Caddo Structure 1 are of use in making some interpretation of the other postmolds found on the site, which do not form obvious visual patterns. According to the Teran-Soule model (Chapter 2), a Caddo farmstead could exhibit postmold patterns which represent three kinds of structures at minimum: houses, storage platforms, and ramadas. Ramadas were expected to consist of six posts 30

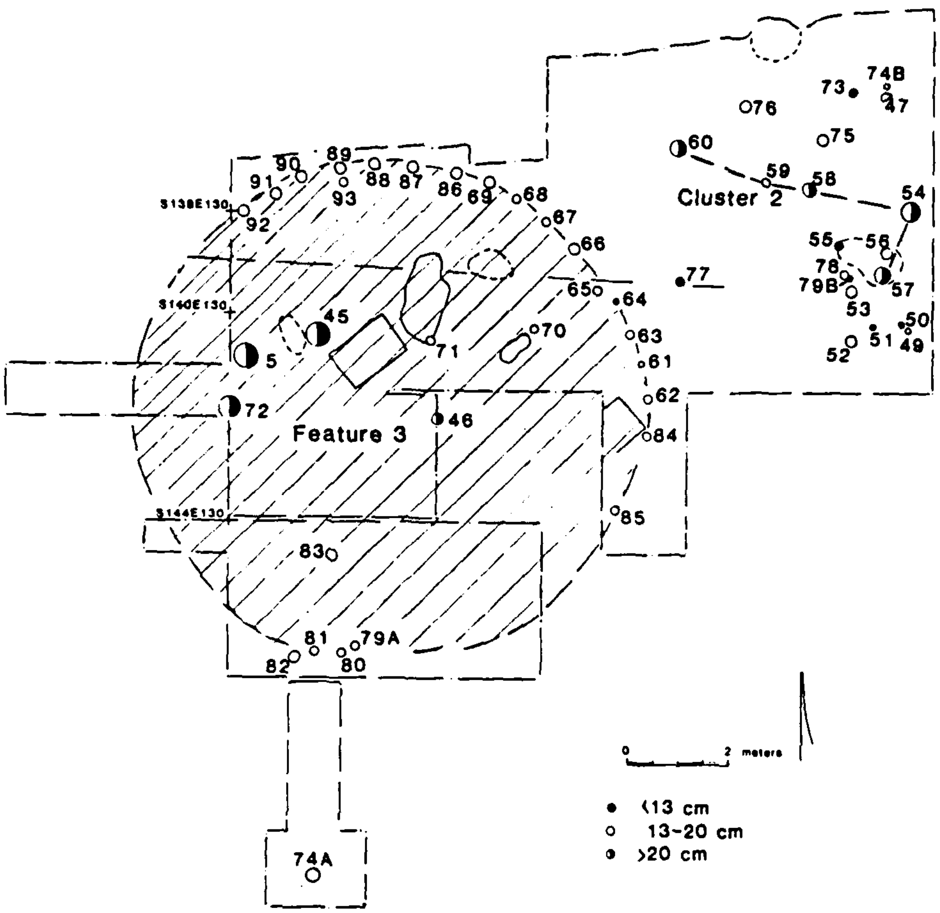

Figure 9-14. Postmold patterns in the indirect impact zone

cm in diameter or slightly greater, formed in a rectangular pattern with about 1.5 m between posts. Storage platforms were projected to consist of a circular pattern between 3-5 m in diameter composed of 40-60 posts; the posts were expected to be about 40 cm apart and 10 cm in diameter. Houses were projected at having posts around 30 cm in diameter in a circular pattern between 6 and 15 m in diameter (Table 9-2).

Even though the complete wall line was not traced, Caddo Structure 1 falls within the range of the Caddo houses, having a diameter of 9.6 m. Using this size structure as a possible model for other structures a template was placed over the other postmolds mapped on the site to see if any other curving wall patterns could be defined. A partial circle of about 10 m in diameter was found in the direct impact zone for Postmolds 12, 13, 14, 24, 23, 42/43, 21, 25, 32, and 26, but as there are large gaps in this circle, and as there were no internal features as would be expected within a Caddo house (as were found in Caddo Structure 1), this pattern was rejected as fortuitous rather than built. Although it might be expected that there would be no features within the circle of a storage platform, this circle would have been too large for such a structure.

As the size of posts may be an indicator of structure patterns the postmolds were stratified on the basis of their diameters. The twenty postmolds in the wall of Caddo Structure 1 ranged in diameter from 10 to 20 cm, with the mean at 16.45 cm. Only one of these posts was under 13 cm in diameter, so that was taken as the dividing point for posts that were smaller than wall size (less than 13 cm), with posts that were wall size at 13-20 cm, and posts greater than 20 cm as larger than house wall size. For the whole site there were 15 posts (17%) in the lower category, 47 posts (53%) in the house wall category (including the 20 known wall posts for 22%) and 27 posts (30%) in the larger size category, with the biggest diameter posts at 45 cm. The distribution of these different sized post categories is plotted on Figures 9-14 and 9-15. While the two smaller post sizes reveal no clear pattern outside that already noted for Caddo Structure 1, the largest category of posts, greater than 20 cm, seem to form several clusters or patterns.

Within Caddo Structure 1 there are four of the large size posts, numbers 5, 45, 46, and 72. Postmold 46 is close to what would have been the center of the house, while the other postmolds cluster together (Cluster 1) on the west side of the house (Figure 9-14). These large postmolds may indicate support posts for the structure (possibly temporary as Postmolds 5 and 45 were shallow). Such support posts were found in the only other comparable late Caddo houses known to the author, Houses 1, 2, 5, 6, and 7 at the Belcher site in Louisiana (Webb 1959).

Just to the outside and northeast of Caddo Structure 1 among the jumbled postmolds there are four large posts, numbers 54, 57, 58, and 60, which could be a cluster (#2) that was part of a ramada rectangle. Postmolds 60, 58, and 54 may represent part of a side of the ramada, with

Table 9-2. Comparison of late Caddo houses

Site	Structure	House Diameter (m)	Range spacing between postmolds (m)	$\overline{X}$	Diameter Range	Entranceway
Cedar Grove, AR	Structure 1 (Belcher IV)	9.6	.4-1.36	.68	.10-.20	Recognized
Belcher, LA	House 1 (Belcher IV)	9.14		.61	.15-.23	None Recognized
Belcher, LA	House 5 (Belcher IV)	11.28-11.73	.61-.76		.15-.20	None Recognized
Belcher, LA	House 2 (Belcher III)	9.14	.46-.61		.10-.23	Present-NE
Belcher, LA	House 6 (Belcher III)	10.97-11.28		.76	.15-.36	Present-NE
Belcher, LA	House 7 (Belcher III)	12.19	.61-.76		.12-.17	Present-NE
Hatchel, TX	House 1 to 16	4.57-7.62				Present E or SE

Note: Hatchel (Davis 1970); Belcher (Webb 1959) Belcher measurements (converted to metric)

post 57 at a right angle. The distance between posts 60-58 is 2.48 m, between posts 59-54 it is 2 m, and between 54-57 it is 1.36 m. These figures are both smaller and greater than the projected estimate of a 1.5 m interval between ramada main post supports, but some of the smaller posts, such as 59 between 58 and 60, could represent smaller supports. However, these distances could reflect a ramada just as well as the estimate made from Soule photographs of a nineteenth century Caddo homestead. This possible ramada is also closer to the structure than the model projected, being within 3 m of the house, rather than about one house diameter (9-10 m based on Caddo Structure 1) from the house.

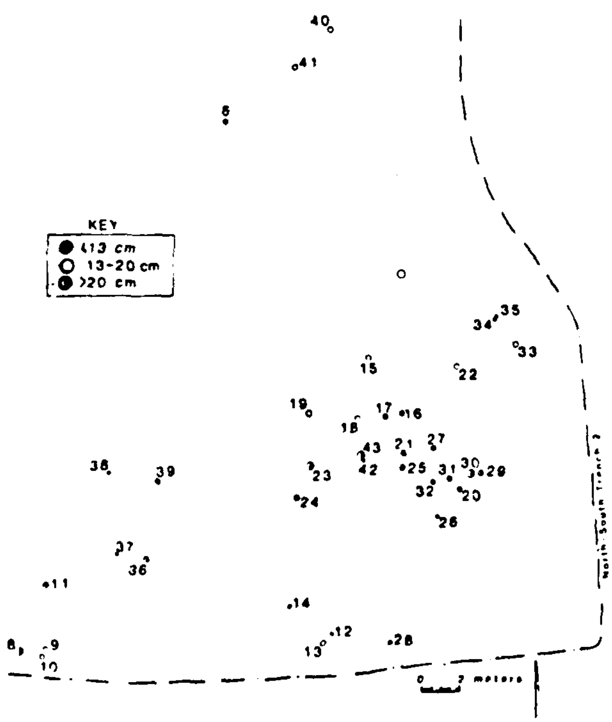

Figure 9-15. Postmold size distribution in the direct impact zone

In the direct impact zone there is another cluster (#3) of large postmolds (Figure 9-15). This includes Postmolds 20, 21, 23, 24, 25, 29, 30, 31, 32, 42, and 43. Distances between these posts vary from only .6 m (posts 21-30) to 5.25 m (posts 21-24), and the maximum width of about 2 m is larger than that of Cluster 2 in the indirect impact zone (although Cluster 3 is not as wide at 1.2 m between posts 30 and 31). This area might well have contained a ramada or two that underwent some repairs, hence the pattern is not a single clear rectangle. The total east-west dimension of this cluster is 10 m.

Other than Caddo Structure 1 (Feature 3) and Clusters 2 and 3 of the postmolds larger than 20 cm (possibly representing portions of ramadas), no other possible house, storage structure, or ramada floor plan outlines could be distinguished from the postmolds that were discovered between the various historical features that had disturbed the earlier Caddo component.

CADDO STRUCTURES

Data from a combination of settlement pattern distribution and artifact counts of daub suggest that there may have been one or two Caddo houses (postulated as Structures 2 and 3) besides Structure 1 at 3LA97. The relevant features of each Caddo structure are outlined below.

Caddo Structure 1 (Feature 3)

As noted, Caddo Structure 1 is the one readily definable Caddo building represented archeologically at 3LA97 (Figure 9-14). The outer wall included 20 postmolds, but not all of this wall could be uncovered. Therefore the one gap in the wall line that was larger than most intervals between posts (1.32 m as opposed to a mean of .68 m) could not be assessed to see if it might represent an opening or entrance. Inside this circle there were two posts in the wall size category (Postmolds 70 and 83) and four postmolds in the larger than wall size category (Postmolds 5, 45, 46, and 72). Postmold 46 was near the center of the structure, while the other three posts clustered on the west side; they may have represented structural supports, while the smaller posts may have marked partitions.

Five features (numbers 14, 15, 17, 18, and 19) and two aboriginal burials (numbers 13 and 15) were found within the circle of the house wall (Figure 9-14). Six historic burials (numbers 116-120 and 128) disturbed the interior of the house. Features 14 and 15 are thought to represent floor

depressions in the midden, Feature 17 is a bell-shaped pit, and Feature 18 represents some kind of feature that was subjected to heating, although no evidence of the burning of an active fire in the feature was found. Burial 13 was that of a nine month old infant, unaccompanied by any grave goods. Burial 15 ws a flexed six year old child with two pottery vessels.

All features yielded large amounts of daub. Both Postmolds 5 and 45 also had daub in them, particularly in the latter post which contained 398 g of daub, which made up most of the midden fill of the postmold; this was 88% of the daub collected from all postmolds on the site. The 22 g collected out of Postmold 5 was another 5% of the daub found in all the postmolds, even though it was taken from only a quarter of that post. No other posts had more daub in them, and the concentration of this material therefore appears to relate to their location within the structure.

The investigations near Caddo Structure 1 were aimed at defining the settlement pattern of that building, and thus most of the midden was hand stripped away. However, some measured samples were taken of the midden within Feature 3's outline. A column sample at S139.5 E132 was excavated in two 10 cm levels (total volume .06 m^3 or 60 liters). The waterscreening (1 mm mesh) yielded a rough sort total of 14 sherds, 31 g of daub, 9 chipped stone artifacts, 1 g each of floral and faunal remains, and 142 g of fine screen material. A second column sample at S141 E131.5 in one level (total volume .03 m^3 or 30 liters) yielded 9 sherds, 83 g of daub, 4 g of flakes, and 2 g of animal remains. A 17 liter bucket sample of house midden was waterscreened through 6.4 mm mesh, yielding 12 sherds, 84 g of daub, 4 g of debitage, and 1 g each of floral and faunal materials.

A transect of four 17 liter midden samples was also excavated across the indirect impact zone along the east-west coordinates between S140.84 and S141.4. The collections from these 6.4 mm waterscreened samples reflect the concentration of daub within Feature 3.

The features, postmolds, and general midden samples all reflect daub concentrations associated with the Caddo structure. Daub concentrations were found at Belcher in Louisiana in Houses 1 and 2 over the area of the roof support postmolds (Webb 1959:59). Although Webb had no firm explanation for this phenomenon, he did suggest that such concentrations may reflect interior partitions. He cited Lewis and Kneberg (1946) as advancing the explanation of heavy plastering around the central smoke aperture of the roofs of houses at Hiwassee Island in Tennessee causing burned daub concentrations over the center of house ruins. However, as Schambach noted above in his discussion of Feature 18, the ethnohistoric records do not indicate such smoke holes on Caddo houses; his interpretation of the baking or heating of daub within Feature 18 may provide another explanation for this phenomenon.

Two types of house construction appear on the Teran map of a Caddo village in the late eighteenth century (Figure 2-1). Harrington (1920) drew details of the grass-lodge and walled house (reproduced here as Figure 9-16a,b). Harrington provided an account by Joutel of a grass house built by the Cenis, a similar one among the Assonis, and a description of a ramada:

> There are ordinarily eight or ten families in these cabins, which are very large, some being sixty feet in diameter . . . . They are round, in the form of beehives, or, better, of great haystacks, only higher, and are covered with grass from bottom to top. The fire is built in the middle; the smoke goes out at the top through the grass. These savages make them . . . by cutting tall trees about as big as the thigh, planting them in a circle, and joining them together at the top; after which they lath them and thatch them from the bottom up . . . . They raise the beds where they sleep about three feet high, fix them neatly enough with large canes, and separate each bed from the others with mats (Joutel 1887).

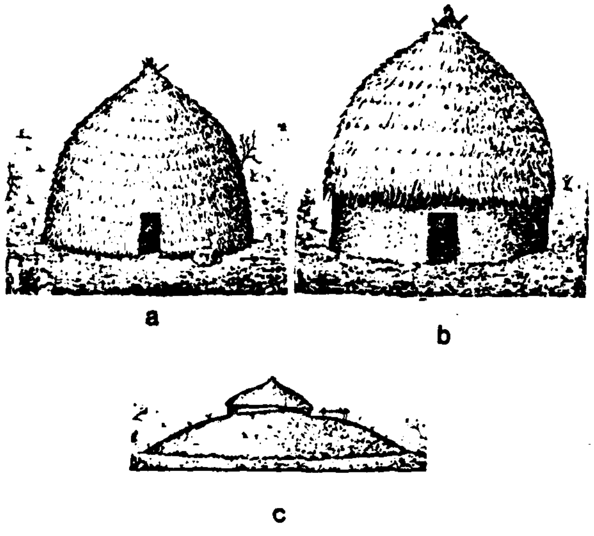

Figure 9-16. Caddo structures after the Teran map of 1691-1692. a. grass lodge; b. walled lodge; c. mound with structure on top (Courtesy of Museum of the American Indian, Heye Foundation, N.Y.)

The Assonis, near relatives of the Caddo had similar dwellings, only not so high. In writing of them Joutel says:

> They have a great shelf above the door, built of sticks set upright, and others laid across, and canes laid side by side and closely bound together, on which they place their corn on the ear. There is another opposite where they put the hampers and barrels they make of canes and of bark, in which they put their shelled corn, beans, nuts, acorns, and other things, and over these they store their pottery. Each family has its own private receptacles. They have their beds to the right and left in the manner I have described. They also have a large platform, ten or twelve feet high, in front of their houses, where they dry their ears of corn after gathering" (Joutel 1887:394).

Joutel's description of the Ceni and Assoni house is confirmed by Manzanet in describing a house of the "Tejas," or Aseney, and he adds that there were no windows, all the light entering through the door, and that the beds were covered with an arch or canopy made of canes, lined with a very bright-colored piece of cane matting, and coming down to the head and foot, making a very pretty alcove (Harrington 1920:249-249).

Harrington interpreted the walled houses as having "a wall of upright poles, five or six feet high, with canes interwoven to serve as lath, and then plastered with mud, as were the houses of the Natchez, the whole surmounted by the domed roof of thatch" (Harrington 1920:252).

Due to its circular shape and the presence of the quantities of daub in both features and midden within the house, Caddo Structure 1 at Cedar Grove fits the ethnographic model of a round walled house with a thatched roof. The presence of adolescent burials within houses is common on Caddo sites, and the other features

concentrated within the circle of posts also indicate that Caddo Structure 1 was a domicile.

One of the few other sites for which we have comparable late Caddo structure data is Belcher (Webb 1959) in Louisiana. There Webb separated the structures he found both in house and burial mounds by age, yielding five houses dating to the Belcher phase of the Caddo IV period (Table 9-2). Of these, Houses 1 and 5 at Belcher were the latest buildings, while Houses 2, 6, and 7 were earlier. House 7 was on a Burial Mound A, House 2 was buried beneath house 1 on Burial Mound B, and House 6 surmounted House 5 on a low "house" mound. The houses on the mounds might be more analogous to Harrington's (1920) "town houses" (Figure 9-16c). The earlier houses, numbers 2, 6, and 7, had entranceways projecting from the northeast side of the circles. These structures were circular in outer wall outline, with inner rows of posts (probably supporting platforms) and clusters of interior support posts. Caddo Structure 1 at Cedar Grove fits this general pattern. The Cedar Grove house is most similar in size to Houses 1 and 2 at Belcher. The size of the postmolds are comparable to all five of the Belcher houses, as was the spacing between the postmolds (Table 9-2).

It should be noted that the Belcher houses from Mounds A and B, contained evidence of intentional burning, breakage of pottery, and sherd dispersal, and multiple simultaneous burials after destruction of the houses. These data indicate that the structures in the mounds were associated with high status funerary rites, and were not simple residences. Houses 5 and 6 of the house mound at Belcher might be more analogous in function to Caddo Structure 1 at Cedar Grove, although those Belcher houses, in their proximity to the mounds, may have been the residence of higher status individuals than those of farmers. Although the Cedar Grove burial population shows evidence of a ranked society (Chapter 16), all the evidence seems to point to the fact that the inhabitants of Cedar Grove were not of comparable high status as persons who might be interred in mounds (see below). The Hatchel site (Davis 1970:50) in northeast Texas is also a Caddo IV period site that had structures on a mound, although these were smaller than those at Cedar Grove and Belcher (Table 9-2).

In summary, Caddo Structure 1 (Feature 3) at Cedar Grove was a circular domicile, 9.6 m in diameter, with posts spaced an average distance of .68 m apart. These posts were probably interwoven with cane and sticks to form a latticework on which clay was pressed, forming a walled wattle and daub structure, that probably had a thatched roof supported by large interior posts. Two adolescent burials, a baked pit and a bell-shaped pit, for storage and/or garbage disposal were the main features within the house.

Based on these characteristics two other possible Caddo structures were postulated to have been present in the direct impact zone (Figure 9-17).

Table 9-3. Daub by weight in direct impact zone major excavation units

Excavation Units	Daub (g)	Columns Levee Fill Muck Ditches	Water Screened Midden
Levee Transect			
Unit 0	867	239	629
Unit 1	347	134	213
Unit 2	395	184	211*
Unit 3	3787	121	265
Unit 4	182	60	122
Unit 5	451	398	53
Unit 6	246	136	110
Unit 7	182	154	28
Unit 8	227	38	189
Unit 9	418	85	333
Unit 10	235	64	171
Unit 11	621	248	372
Unit 12	4728	2417	2311*
Extension	1357	1357	
Unit 13/14	4767	4302	465
S48.77 E157	197	22	175
S79.27 E161	15		15
S42 E178	386	8	378
S54 E184	181		181
S57 E184	80	80	
S72.5 E185	161	3	158
S55 E187.5	80		80
S75.5 E188	215	3	130
S78.5 E191	44	8	36
S72 E212	27		27

*screen size 1.0 mm; all rest 6.4 mm

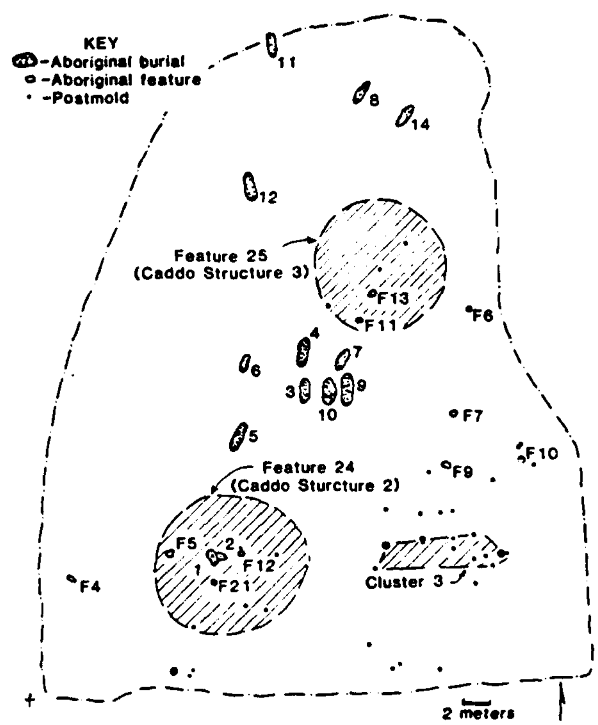

Figure 9-17. House and ramada interpretation of the direct impact zone

Caddo Structure 2 (Feature 24)

This structure was probably somewhere near Levee Transect Units 11, 12, and 13/14 and the west extension of Levee Transect Unit 12 (Figure 9-17). This possible structure is indicated by the coincidence of high daub concentrations recovered in those units (Figure 9-18 and Table 9-3) plus the proximity of Postmolds 11, 36, 37, 38, and 39, Features 5, 12, and 21, and Aboriginal Burials 1 and 2 (one human and one animal).

Postmolds 11, 36, and 39 are larger than wall post size, Postmold 37 is in the wall post range, and Postmold 38 is smaller than most wall postmolds. Features 5 and 12 were undifferentiated pits and Feature 21 was a midden floor depression; none of these features contained daub though it is noted that no flotation was collected from

Feature 5 and Feature 12 only had a flotation sample of 5 liters, only one-sixth as much soil as in a column sample level. Aboriginal Burial 1 fits the pattern of interment of children within houses on Caddo sites, as it was an infant aged 12 to 18 months that was buried extended with ceramic grave offerings, and the eagle interred adjacent to it in Burial 2. The structure is proposed to have a ca 10 m diameter.

High daub concentrations were associated with the interior of Caddo Structure 1. However, the heaviest daub concentrations recorded on the site came from the south end of the levee transect near the above noted features. If one subtracts the levee overburden deposits and column sample portions of each excavation unit out of the daub weight totals (Table 9-3) the high concentration of daub in the undisturbed midden deposits is still apparent, with 2,311 g recovered in Levee Transect Unit 12. This unit's midden was screened through 1 mm window screen rather than 6.4 mm screen, as was that of Levee Transect Unit 2, which only yielded 211 g of daub in the midden, so even the difference in screen size does not affect the fact that the daub concentrations were heaviest at the south end of the levee.

The potential for there having been a Caddo house in the vicinity shown for Feature 24 is enhanced by the presence of cluster 3 of the larger than wall size posts, which could represent a ramada (Figurte 9-17). This ramada would have been between 6 and 10 m away from the proposed location of Feature 24. Such an arrangement would mirror that of Caddo Structure 1 with its ramada to the east.

Caddo Structure 3

This feature is another possible Caddo house, postulated on the basis of the near association of some settlement pattern with a daub concentration, although this association is not as strong as that for Caddo Structures 1 or 2. This possible house is marked by a high daub concentration in Levee Transect Unit 0, which is north of Postmolds 6, 40, and 41, and Features 11 and 13.

Postmold 6 was within the range of larger than wall size posts, while Postmolds 40 and 41 were of wall size diameter. Feature 11 was the animal bone cache. This feature had the third highest amount of daub by weight of any features found on the site; only Features 17 and 18 in Caddo Structure 1, which were larger, had greater amounts of daub. Feature 13 was an undifferentiated pit that contained no daub.

Unfortunately, the area immediately east of the hypothesized Feature 25 house was disturbed by the historic roadbed and cut away during the revetment construction activities before the site was discovered. Both proposed Caddo Structures 2 and 3 cannot be traced out due to the great amounts of pre-1930 historic disturbance on the site from cemetery, levee, and roadwork.

Daub Concentrations Outside of Houses

Inspection of Figure 9-18 reveals that three columm samples on the west side of the site yielded the highest amount of daub of any of the 54 column samples excavated outside larger excavation units in the direct impact zone. The total amount of daub recovered in these units weighed 1118 g, with a mean weight of 20.7 g. Actually the mean statistic is somewhat misleading since, except for the three column samples named, no other column sample had over 12 g of daub recovered from all excavated levels. The 653 g of daub in column sample S69 E157 represents 58% of all daub recovered in such excavations, while S64 E154 recovered another 25% with 281.5 g. Unit S60 E154, with only 27.5 g was 2% of the daub; this gives a total for the three samples of 85% of the daub in column samples. The daub in column sample S69 E164 even exceeded that found in any of the 3 m excavation units and 10 of the 2 m levee transect units.

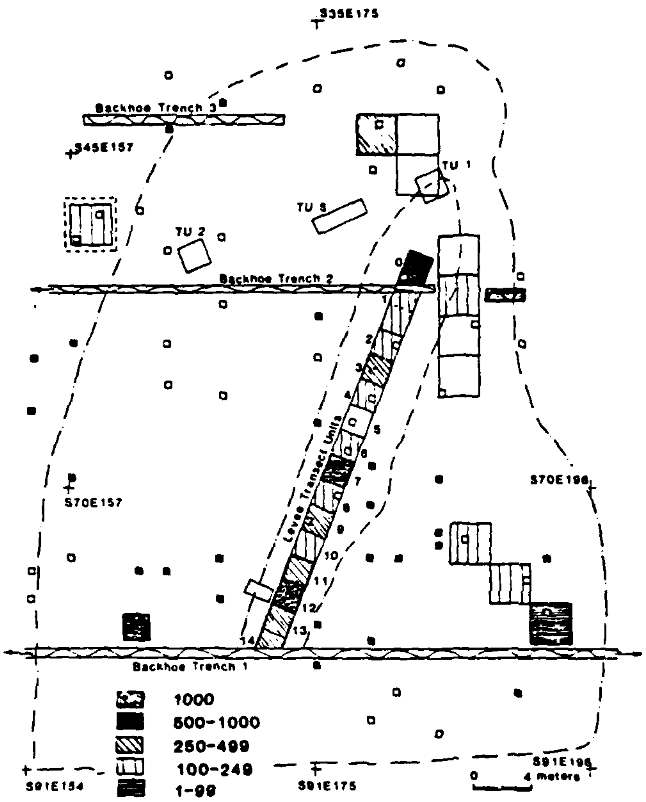

Figure 9-18. Distribution of daub by weight in direct impact zone excavations west of N-S Trench 2

The close association of these three samples and their high daub counts is far from coincidence. These samples came down on the sloping bank of the midden on the west side of the point bar rise, as it dropped off into the water filled slough that once bordered the farmstead. The three samples line up with the sloping midden profile in Backhoe Trenches 2 and 3, which trends from southwest to northeast. This slope angles farther west as one goes south on the site; therefore it was not found in the profile of Backhoe Trench 1 as that unit stopped short. The three column samples went down between 60 and 80 cm before they got through the thick midden deposits on the bank slope.

Thus, the column sample distribution of daub has brought us full circle from the chapter's beginning discussion of the location of 3LA97 on a point bar ridge along the axis of Lester Bend. The last daub concentration reflects an overbank garbage disposal pattern at Cedar Grove. The settlement pattern of the site also reflects the point bar orientation. A minimum of one homestead, and possibly two others, were situated along the top rise of the point bar, with their ramadas and possibly storage platforms and cultivated fields on the more gradual eastern slope of the point bar. The late Caddo inhabitants of Cedar Grove were closely attuned to the local floodplain environment, and made measured decisions as how to best make use of that environment in the placement of their homes.

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Chapter 10

THE ABORIGINAL CEMETERY

by Neal L. Trubowitz

This chapter provides an introduction to and overview of the aboriginal cemetery at Cedar Grove. Figure 10-1 presents the overall location of the burials in the direct impact zone and a grouping of these burials which is discussed later in this chapter. Figures 10-2 through 10-16 show the plan views of the burials and a listing of the associated artifacts. Later chapters deal with the bioarcheology of the cemetery (Chapter 16) and present detailed analyses of the burial artifacts (Chapters 11 through 15). In the 1980 fieldwork, 15 aboriginal graves were numbered as discussed in the previous chapter. Aboriginal Burial 2 turned out to be a bald eagle with some human pieces included from Aboriginal Burial 1, probably a result of stripping the midden by the heavy machinery. During the course of the removal of the Cedar Grove historic cemetery in 1982 (discussed in detail in Rose 1983), it was necessary to pull back a portion of the eroded and much reduced historic levee east and south of Historic Burials 29 and 30. After heavy rains the backdirt piles from this operation revealed the fragmentary remains of a mandible, cranium, and postcranial elements of an aboriginal child approximately three years old (see Rose's assessment in Appendix VII). This was labeled Aboriginal Burial 16. Also recovered from the backdirt piles were 16 whole or fragmentary "miniature" Caddo vessels, a bear canine, and some drilled marine shell beads similar to those found in Burial 3. The burial may well have been placed inside a Caddo Structure 3 (Feature 25) in keeping with the pattern elsewhere on the site. The small size of the burial beneath the historic levee had precluded its discovery during the systematic probing of the site in 1980. Table 10-1 details the general classes of grave goods found with each burial. Summaries of the rough sort categories are found in Appendix VI. Details on age and sex are found in Chapter 16.

Most of the aboriginal graves were discovered by probing (see Chapter 8). Only the two burials in Caddo Structure 1 (numbers 13 and 15) and Aboriginal Burial 1 and 2 in the direct impact zone were located without probes. This is probably in part related to these being child burials within house structures, that were not buried as deeply as the adult burials. Usually the fill of the grave pits turned out to consist of almost sterile sand, with little or no trace of midden stains or debris. From this evidence it was apparent that the burials of the adults had been dug before the extension of the general Caddo IV/V midden over them, thus explaining the difficulty of finding grave pit outlines for most of the burials until the excavations had reached almost the bottom of the grave pits, exposing most of the bones and grave goods. This gap between the burials and the base of the midden was observed and measured directly along the levee transect adjacent to Aboriginal Burial 4. There the top of the midden in profile was at an elevation of 68.45 m above mean sea level, and the bottom of the midden was at elevation of 68.34 m above mean sea level (midden thickness 0.09 m). The observable base of Aboriginal Burial 4 was at an elevation of 67.55 above mean sea level, 0.79 m below the base of the midden. Other readings on burial pits were also below the midden. For example the top of burial pit 10 was at an elevation of 67.7 m, the surface of burial pit 9 was at an elevation of 67.57 m, and burial pit 7's surface was defined at an elevation of 67.75 m, all below the midden elevation.

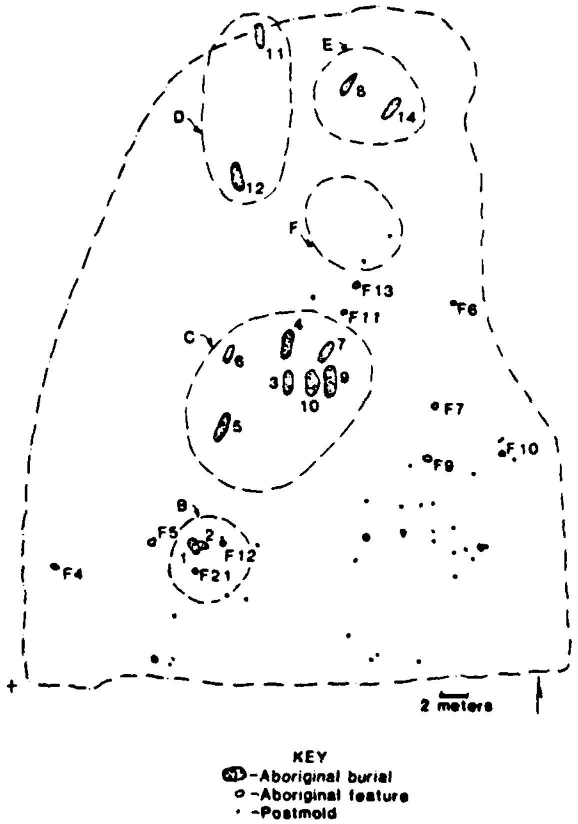

Figure 10-1. **Aboriginal burials and grave groups in the direct impact zone**

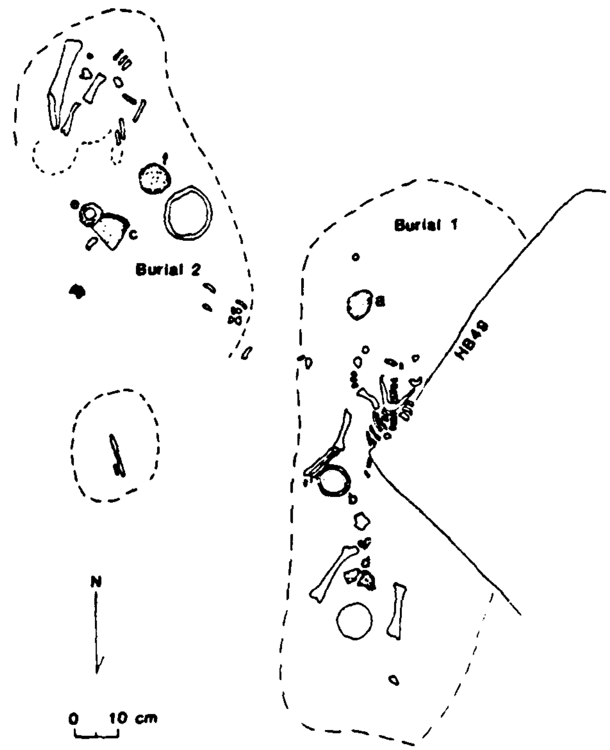

Figure 10-2. Plan view of Aboriginal Burial 1 and eagle burial (Burial 2)
a. FSN620: mussel shell
b. FSN596: untyped bird effigy bowl (vessel 1)
c. FSN608: Hodges Engraved, var. Sentell bowl (vessel 2)
d. FSN602: Karnack Brushed-Incised jar (vessel 3)
e. FSN604: untyped incised bowl (vessel 4)
f. FSN612: untyped engraved jar (vessel 5)

Table 10-1. Aboriginal burial artifacts

Burial Number	Burial Group	Bone points	Lithic points	Necklace shell beads	Shell ear decoration	Lithic flake	Fish offering	Conch shell	Mussel shell	Pigment	Pottery pipe	Bone tools	Animal bones	Shell bracelet	Clay ball	Bone buttons	Bottle	Bowl	Jar	Effigy	Daub	Flora	Soil Samples	C-14 Samples
1	B								x								x	x	x	x	x		x	
2	(nonhuman)																				x		x	
3	C			x					x								x	x			x	x	x	
4	C			x	x									x			x	x	x		x		x	x
5	C			x													x	x	x		x	x	x	
6	C				x																x		x	
7	C	x		x				x	x	x					x			x	x		x		x	
8	F								x			x	x			x	x	x	x		x		x	x
9	C				x		x		x	?					x		x	x	x				x	x
10	C	x		x			x		x	?					x		x	x	x		x		x	x
11	D																x	x	x			x	x	
12	D	x	x						x				x					x	x		x		x	x
13	A																				x		x	
14	E		x			x					x	x			x		x	x	x				x	x
15	A																x		x				x	x

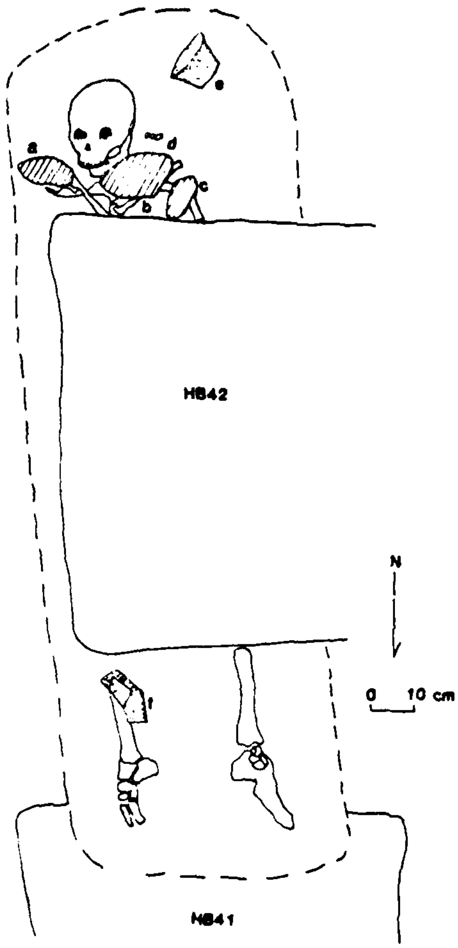

Figure 10-3. Plan view of Aboriginal Burial 3
a. FSN794: mussel shell
b. FSN795: mussel shell
c. FSN796: mussel shell
d. Misc.: 113 small shell bead necklace
e. FSN707: Keno Trailed-Incised, var. Phillips beaker
f. FSH804: untyped plain sherd (bottle?)

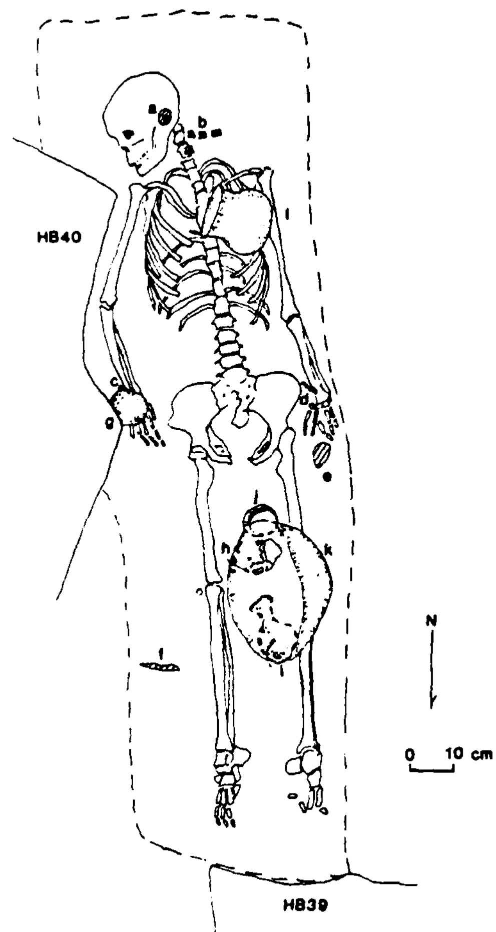

Figure 10-4. Plan view of Aboriginal Burial 4
a. FSN821: shell ear disc
b. FSN825-8: 4 conch shell bead necklace
c. FSN829: 4 conch shell bead bracelet
d. FSN830: 4 conch shell bead bracelet
e. FSN820: mussel shell
f. FSN822: mussel shell hoe
g. FSN709: Hodges Engraved, var. Armour bowl (vessel 1)
h. FSN843: Hodges Engraved, var. Armour bowl (vessel 2)
i. FSN824: Hodges Engraved, var. Candler bottle (vessel 3)
j. FSN823: Hodges Engraved, var. Armour bowl (vessel 4)
k. FSN710: Avery Engraved bowl (vessel 5)
l. FSN708: Foster Trailed-Incised, var. Shaw jar (vessel 6)
Not visible. FSN1542: shell ear disc

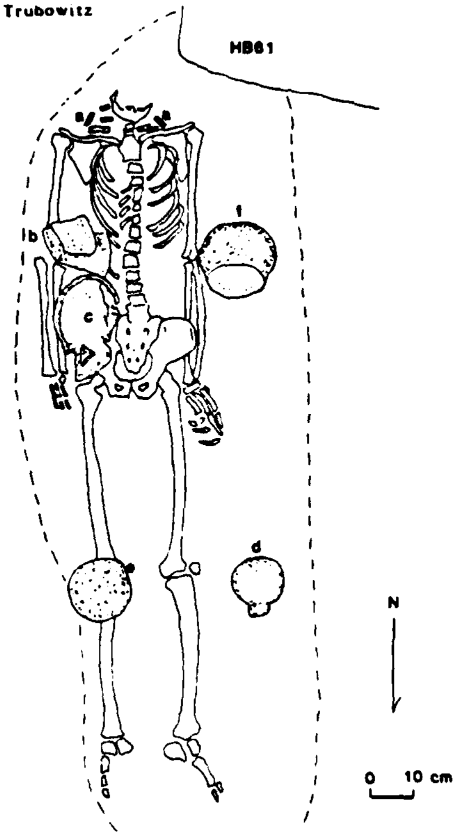

Figure 10-5. Plan view of Aboriginal Burial 5
a. FSN832-7: 8 conch shell bead necklace
b. FSN714: Keno Trailed, var. Phillips beaker (vessel 1)
c. FSN713: Natchitoches Engraved, var. Lester Bend bowl (vessel 2)
d. FSN711: Keno Trailed, var. Glendora bottle (vessel 3)
e. FSN712: Belcher Engraved, var. Owen bowl (vessel 4)
f. FSN715: Foster Trailed-Incised jar (vessel 5)

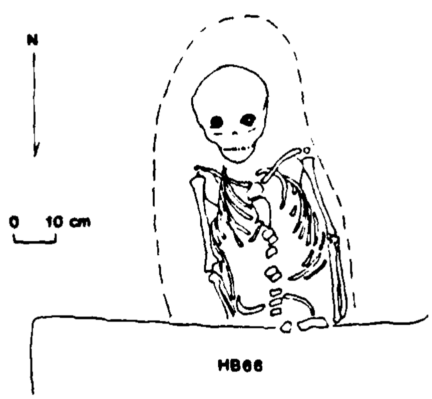

Figure 10-6. Plan view of Aboriginal Burial 6
FSN1233: conch shell ear pendant (on left and right ears)

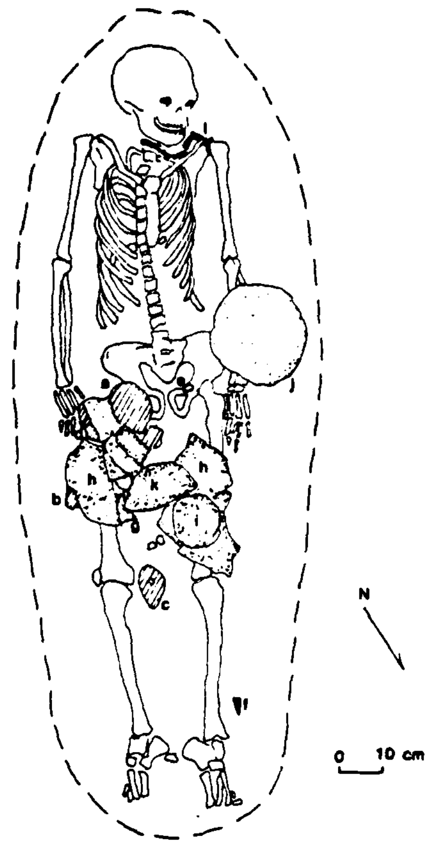

Figure 10-7. Plan view of Aboriginal Burial 7
a. FSN976: mussel shell with red pigment
b. FSN977: conch shell cup
c. FSN980: mussel shell
d. FSN983: mussel shell with green pigment
e. FSN984: clay ball
f. FSN985: antler tip projectile point
g. FSN1139: antler tip projectile point
h. FSN975: Belcher *Ridged jar (vessel 1)*
i. FSN974: Foster Trailed-Incised jar (vessel 2)
j. FSN972: Karnack Brushed-Incised jar (vessel 3))
FSN972: Plain bottle fragment (vessel 4)
k. *FSN973*: Belcher Engraved, var. Owen bowl (vessel 5)
Not visible. FSN1138: nonhuman *bone* (beneath cervical vertebrae)
FSN972: Plain bottle fragment (vessel 4) (on left arm/pelvis)

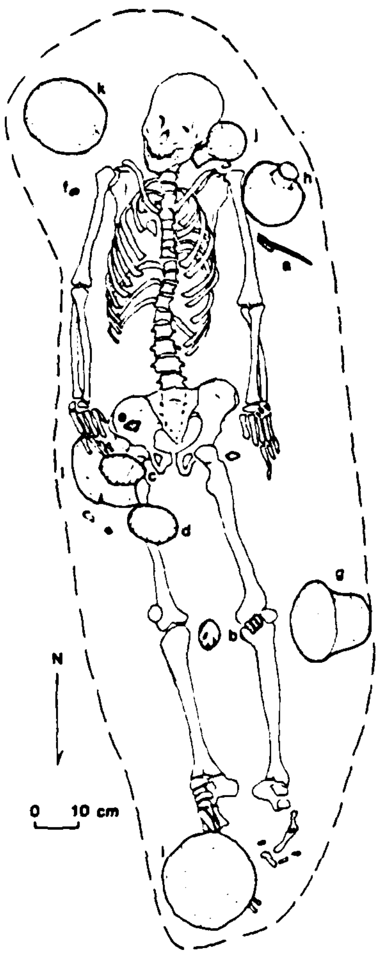

Figure 10-8. Plan view of Aboriginal Burial 8
a. FSN770: animal bone tools
b. FSN774: animal skull and bones
c. FSN777: mussel shell
d. FSN894: mussel shell
e. FSN895: mussel shell
f. FSN898: mussel shell fragments
g. FSN766: Foster Trailed-Incised, var. Foster jar (vessel 1)
h. FSN764: Belcher Engraved, var. Ogden bottle (vessel 2)
i. FSN765: Belcher Engraved, var. Belcher bowl (vessel 3)
j. FSN767: Belcher Engraved, var. Ogden bottle (vessel 4)
k. FSN763: Belcher Engraved, var. Belcher bowl (vessel 5)
l. FSN893: Belcher Engraved, var. Belcher bowl (vessel 6)

Figure 10-9.
Not visible. FSN1167: conch shell pendant (on left ear) FSN1171: fish scales (by left foot) FSN1325: mussel shell (under left rib cage) FSN1323: nonhuman bone (beneath cervical vertebrae) FSN1167: 2 bone buttons (in grave fill)

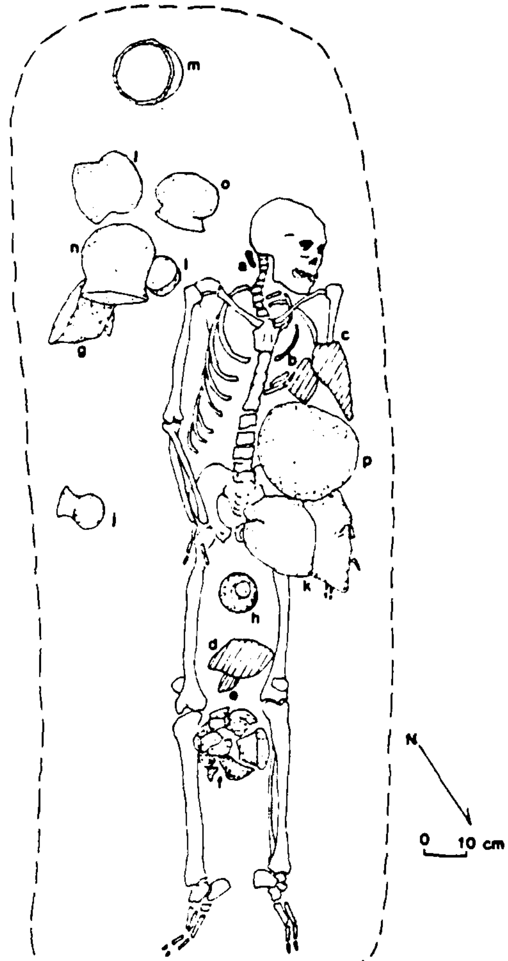

Figure 10-9. Plan view of Aboriginal Burial 9
a. FSN1185: conch shell pendant (on right ear)
b. FSN1168: fish skeleton
c. FSN1178: fish skeleton
d. FSN1169: mussel shell
e. FSN1173: mussel shell

f. FSN1172: Cabaness Engraved bowl (vessel 1)
g. FSN1180: Cabaness Engraved bowl (vessel 2)
h. FSN1174: Hodges Engraved, var. Kelly's Lake bottle (vessel 3)
i. FSN1181: Engraved bowl (Patton Engraved?) (vessel 4)
j. FSN1175: Hodges Engraved, var. Candler bottle (vessel 5)
k. FSN1176: Foster Trailed-Incised, var. Moore jar (vessel 6)
l. FSN1183: Foster Trailed-Incised, var. Moore jar (vessel 7)
m. FSN1184: Untyped engraved bowl (vessel 8)
n. FSN1179: Foster Trailed-Incised, var. Dixon jar (vessel 9)
o. FSN1182: Keno Trailed, var. Scott's Lake jar (vessel 10)
p. FSN1177: Hodges Engraved, var. Sentell bowl (vessel 11)

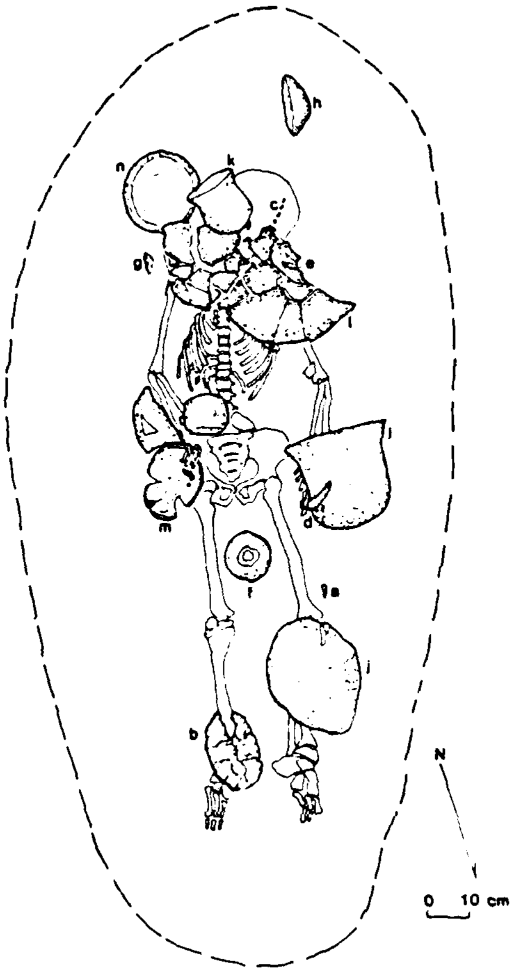

Figure 10-10. Plan view of Aboriginal Burial 10
a. FSN1123: antler tip projectile point
b. FSN1125: mussel shell
c. FSN1127: fish skeleton
d. FSN1154: split nonhuman bone

e. FSN1133: Natchitoches Engraved jar (vessel 1)
f. FSN1124: Hodges Engraved, var. Candler bottle (vessel 2)
g. FSN1135: Foster Trailed-Incised, var. Shaw jar (vessel 3)
h. FSN1122: Belcher Engraved, var. Owen bowl (vessel 4)
i. FSN1134: Foster Trailed-Incised, var. Moore jar (vessel 5)
j. FSN1129: Untyped bottle base (vessel 6)
k. FSN1126: Foster Trailed-Incised, var. Finley jar (vessel 7)
l. FSN1132: Natchitoches Engraved, var. Lester Bend bowl (vessel 8)
m. FSN1145: Belcher Engraved. var. Owen bowl (vessel 9)
n. FSN1147: Foster Trailed-Incised, var. Dixon jar (vessel 10)
Not visible. FSN1131: nonhuman bone (beneath bowl on left leg) FSN1148: clay mass (beneath vessel 10)

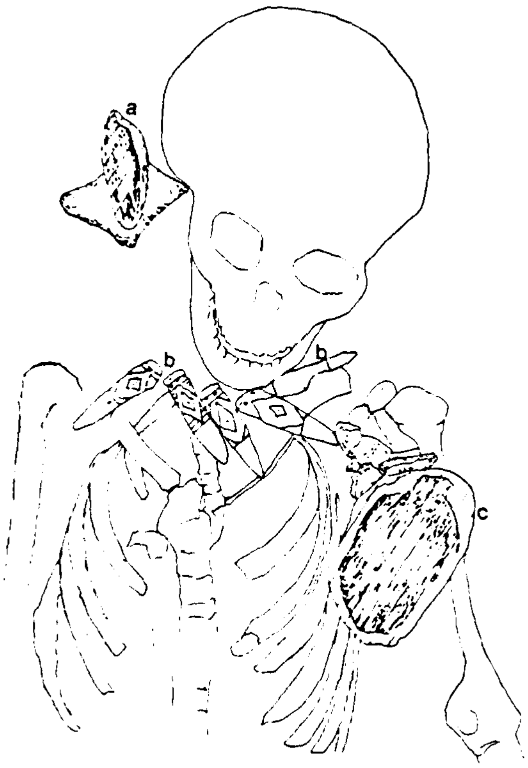

Figure 10-11. Detail of conch shell pendants and mussel shell in situ in Aboriginal Burial 10.
a. FSN1143: mussel shell (on right side of head)
b. FSN1144: 5 conch shell pendant necklace (around throat on chest)
c. FSN1142: mussel shell (on left arm, rib cage)

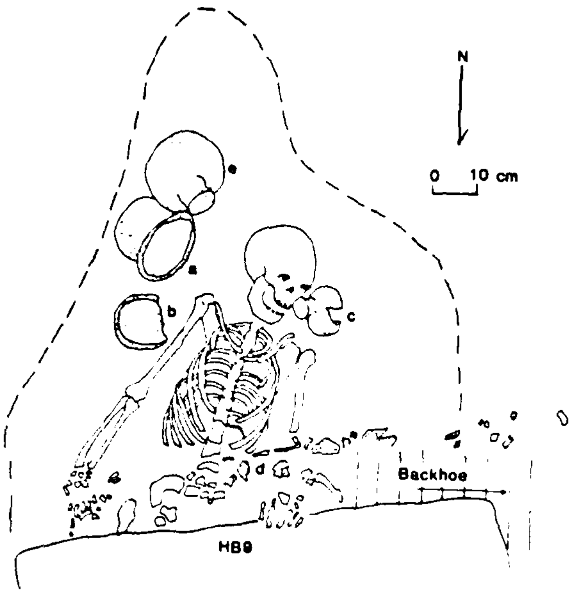

Figure 10-12. Plan view of Aboriginal Burial 11
a. FSN697: Karnack Brushed-Incised, var. Fish Bayou jar (vessel 1)
b. FSN698: Foster Trailed-Incised, var. Red Lake jar (vessel 2)
c. FSN695: Keno Trailed bottle (vessel 3)
d. FSN699: Foster Trailed-Incised, var. Dobson jar (vessel 4)
e. FSN696: Hodges Engraved, var. Candler bottle (vessel 5)

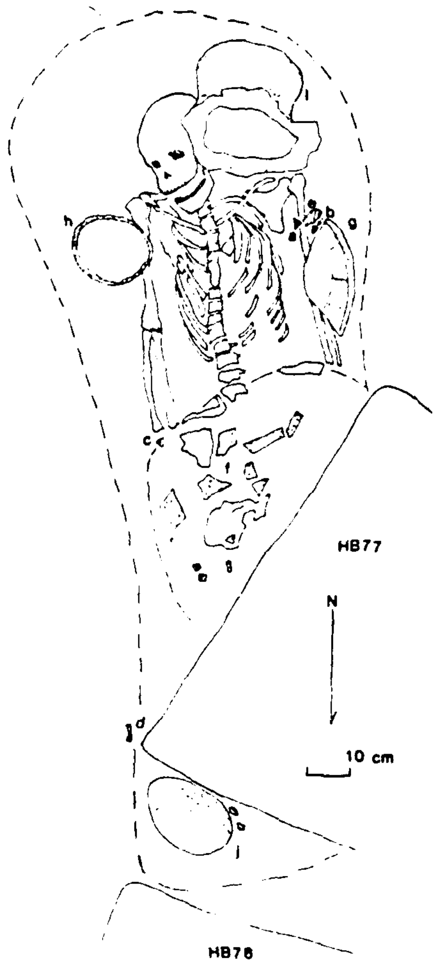

Figure 10-13. Plan view of Aboriginal Burial 12
a. FSN1047: lithic arrowpoint
b. FSN1215: lithic arrowpoint
c. FSN1048: antler tip projectile point
d. FSN1050: rodent mandible
e. FSN1213: mussel shell
f. FSN1202: Hodges Engraved, var. Armour bowl (vessel 1)
g. FSN1211: Belcher Engraved, var. Owen bowl (vessel 2)
h. FSN1201: Karnack Brushed-Incised, var. Karnack jar (vessel 3)
i. FSN1039: Foster Trailed-Incised, var. Dobson jar (vessel 4)
j. FSN1212: Glassell Engraved, var. McGee (vessel 5)

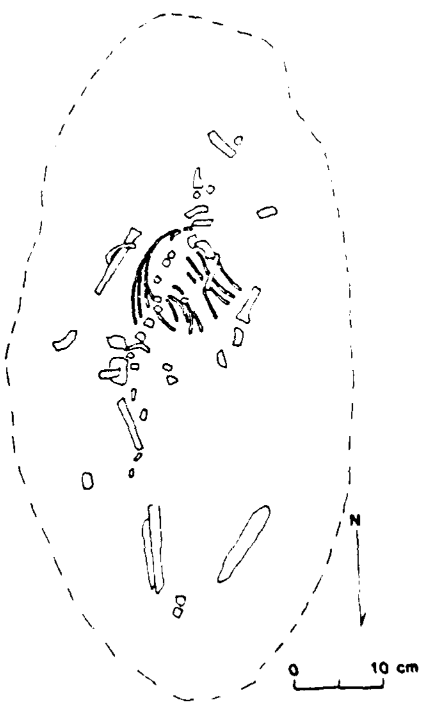

Figure 10-14. Plan view of Aboriginal Burial 13 (no grave goods)

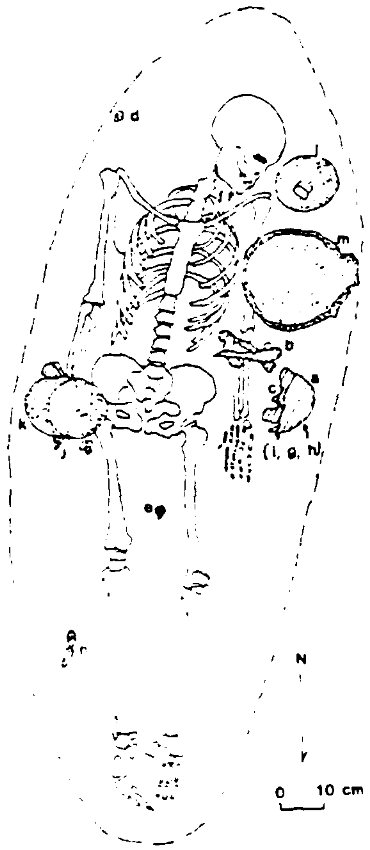

Figure 10-16. Plan view of Aboriginal Burial 15
a. FSN1303: Keno Trailed, var. McClendon bottle (vessel 1)
b. FSN1304: Karnack Brushed-Incised, var. Karnack jar (vessel 2)

Figure 10-15. Plan view of Aboriginal Burial 14
a. FSN1252: mussel shell
b. FSN1254: 5 bone tools
c. FSN1255: 2 bone tools (see Figure 10-22 for details)
d. FSN1253: clay ball
e. FSN1256: lithic flake
f. FSN1261: lithic arrowpoint
g. FSN1554: clay pipe (inside shell a)
h. FSN1555: 2 mussel shells (inside shell a)
i. FSN1556: mussel shell (inside shell a)
j. FSN1257: Avery Engraved, var. Graves bowl (vessel 1)
k. FSN1259: Karnack Brushed-Incised, var. Karnack jar (vessel 2)
l. FSN1250: Belcher Engraved, var. Ogden bottle (vessel 3)
m. FSN1251: Foster Trailed-Incised, var. Foster jar (vessel 4)
n. FSN1258: Belcher Engraved, var. Belcher compound bowl (vessel 5)

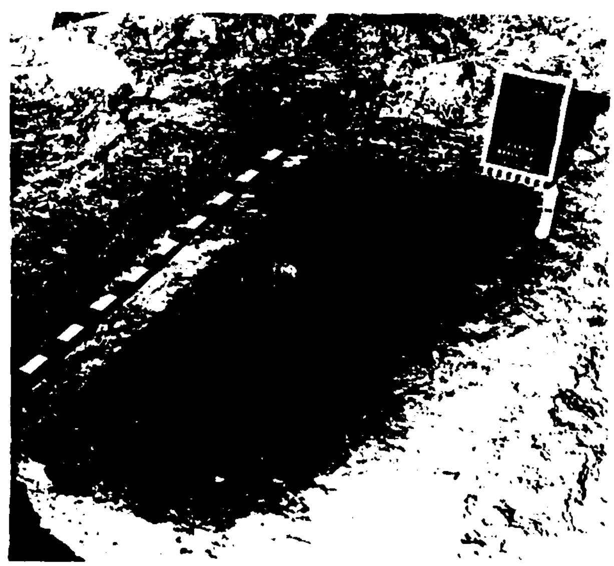

Figure 10-17. Grave pit outline of Aboriginal Burial 9 prior to excavation. (AAS negative number 808038). Note small hole dug to check probe contact. (Large scale in 10 cm subdivisions)

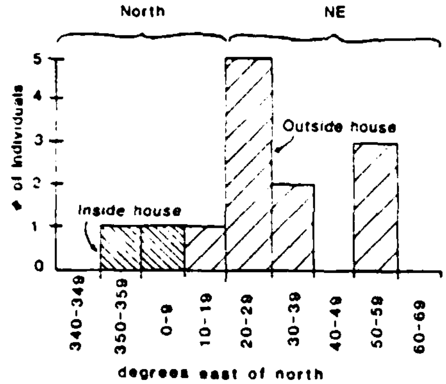

Figure 10-18. Aboriginal grave pit orientations

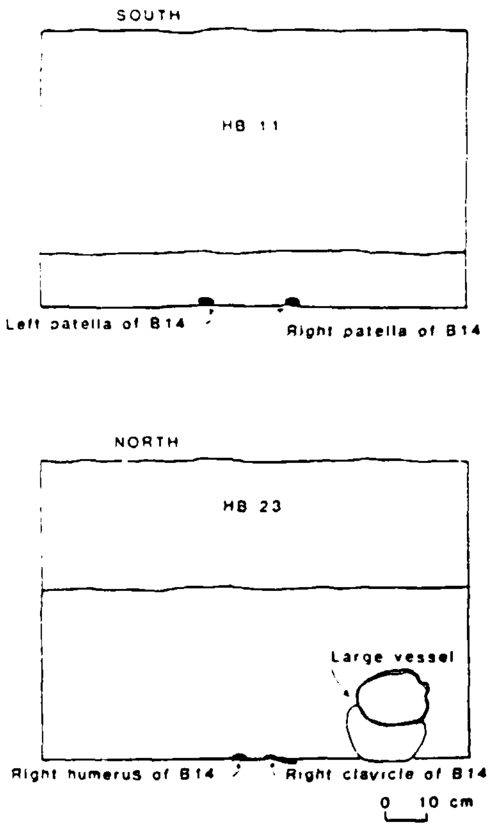

Figure 10-19. Profiles of historic grave shafts, intruding Aboriginal Burial 14

GRAVE PITS

When the grave pit outline was discernible before excavation of the pit began, it appeared as an elongated oval, with rounded ends and roughly parallel sides (Figure 10-17). Except for Burial 15, a flexed burial inside Caddo structure 1, all burials were extended interments, on their backs, oriented with their heads at the south end of the grave shaft, with the feet pointed towards the north. A degree orientation was measured for the graves by drawing a line down the north-south axis of the grave pit and then measuring the angle in degrees east of north. These pits clearly grouped in the north and northeast quadrants of the compass in their orientations (Figure 10-19).

As discussed previously, the deeper burials could only be found by probing. Burial 14 was found completely below and at a right angle to Historic Burials 11 and 23 (Figure 10-18). Unfortunately, all but four of the 14 human aboriginal interments recovered in 1980 were disturbed in some way by historic grave digging, ranging from minor disturbances of a bone or two through destruction of whole sections of the skeleton. The only portion of the body that was undisturbed and present in every grave was the neck and upper chest. Nevertheless, the remaining bone preservation was excellent. Also, as the historic graves were oriented east-west, they ran at a right angle to the aboriginal interments, so there was no problem in distinguishing historic from aboriginal graves.

GRAVE GOODS

A wide range of grave goods and data on their placement in the pits was recorded (Figures 10-2 to 10-16). Pottery vessels were the most common grave goods, and parts of 67 reconstructable vessels were recovered. Shell grave goods were also common. Burial 3 had a bead necklace beneath the mussel shells placed around its neck; by careful note keeping and use of a needle and strong cotton button thread we were able to remove most of these beads in the same order that they were strung. Burial 4, a female, had shell ear discs, beads around her neck, shell bracelets, and pottery vessels. Burial 7, a male, had his right hand within an undecorated conch shell cup (Figure 10-20) covered by a mussel shell with a possible pigment material within it. Such cups have been linked to black

Figure 10-20. Right hand of Aboriginal Burial 7 with conch shell cup and below mussel shell (AAS negative number 808033). Scale in 2 cm subdivisions.

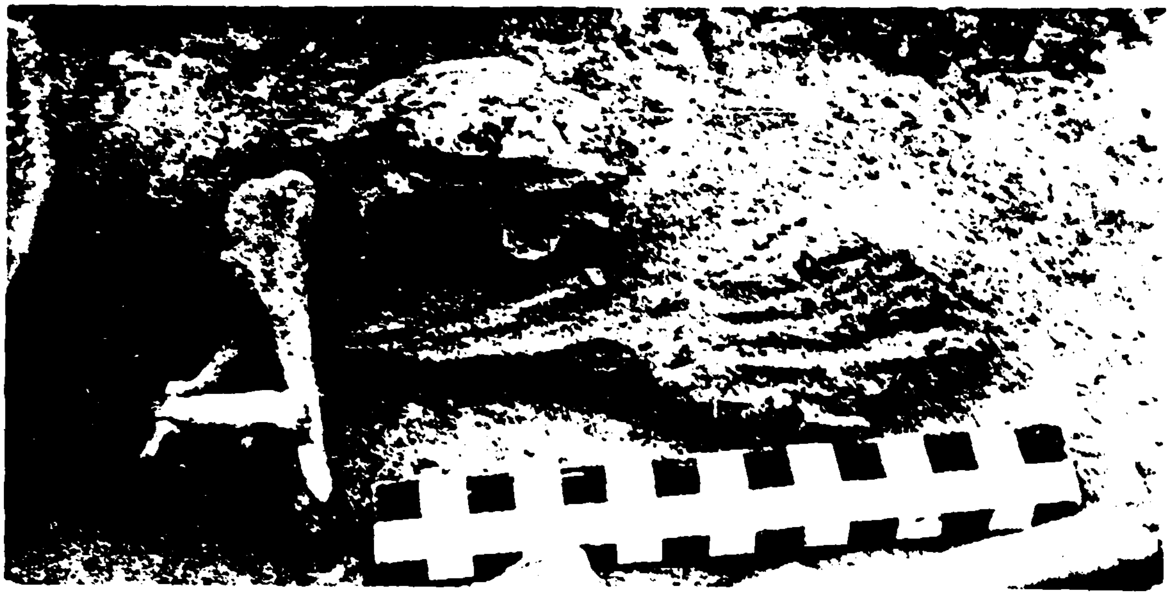

Figure 10-21. Mussel shell and bone tool grave offerings over left arm of Aboriginal Burial 14 (AAS negative number 808053). Scale in 2 cm subdivisions.

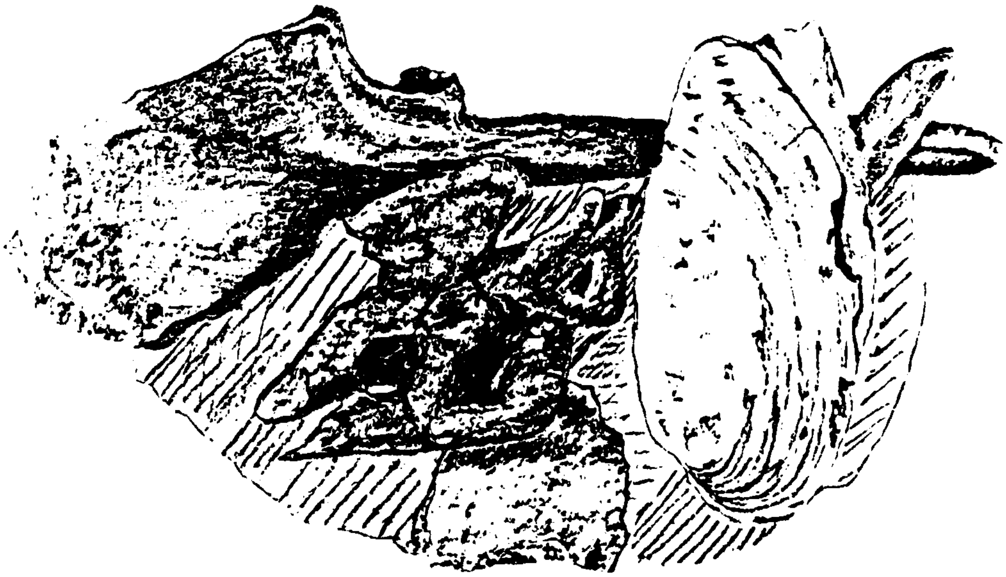

Figure 10-22. Pipe inside shell with flintknapping tools from Aboriginal Burial 14

Figure 10-23. Forehead of Aboriginal Burial 10 covered with a fish offering while rest of the face is hidden by pottery (AAS negative number 808025). Scale in 2 cm subdivisions.

drink religious ceremonialism, a beverage brewed from Ilex vomitoria, which was found in the Southeast from Hopewell times (Middle Woodland period) through European contact (Milanich 1979). The cup from Burial 7 had no decorations or drilled holes (for hanging?) as many other cups have. A detailed analysis of these items is presented by Kay in Chapter 13.

The presence of red and green pigments as grave offerings in mussel shell containers in Burial 7 and a red pigment in a shell found in Burial 9 has counterparts on several Texas sites dating to the eighteenth century (see Chapter 2 under pigments). Harrington (1920:245) identified the possible sources of pigments used by the Caddo. Red was mainly from hematite iron ore, white might have been the carbonate of lead forming a crust on galena ore, and green might have been made from glauconite. Harrington found green pigment smeared on Caddo burial offerings at sites along the forks of Ozan Creek in the Ouachitas northeast of the Red River Valley. At Ozan site 1, the inside walls of a "town-house" on the mound had been painted green. Both red and green paint were found as grave offerings in Mound 10 at the Washington site (Harrington 1920:30). Webb (1959) listed the smearing of burial vessels with green or white pigment as one burial trait of the late occupation at the Belcher site, and also noted lumps of green and white pigment on the floors of some of the houses. The pigments found at Cedar Grove were identified as being native in origin (Chapter 16).

Just above the right shoulder of Burial 14, a male, was a small ball of unfired clay (Figure 10-15d), and over the left arm were several bone tools and a mussel shell (Figure 10-15c,g,h,i and 10-21). Similar tools were found in Burial 8, another male of the same age grade, 35-39 years at death. Inside the shell in Burial 14, the laboratory crew discovered a Caddo pipe (Figure 10-22) that had been pierced by the probe that led to the burial discovery (cf. Kay, Chapter 13).

Socketed antler projectile points were found in Burials 7, 10, and 12, and lithic points were found in Burials 12 and 14. All but Burial 10 were identified as males of this group; Burial 10 was an adolescent (12-15 years old at death) who could not be sexed. However, the association between males and projectile points in this cemetery seems to be prevalent, and it is therefore likely that Burial 10 was also a male. The placement of socketed antler projectile points in Burials 7 and 10 were alike, lying to the left of the left leg, pointing downwards, as if a whole arrow had been laid there. Similar antler points were recovered by Webb at Belcher. Other antler points were found at Cedar Grove in the midden (Chapter 13).

The face of Burial 10 was covered with pottery, and on the left side of its forehead a whole fish offering (a gar) had been laid (Figure 10-23). Other whole fish offerings (gar and gizzard shad) were found in the senior male's grave, Burial 9 to the east side of Burial 10. See the discussion by Styles and Purdue in Chapter 15 for further details. A necklace of five conch shell pendants carved with geometric designs and another mussel shell offering was found in Burial 10. This necklace's pieces are identical to larger ones in Burials 5 and 25 at the Belcher site (Webb 1959: Figure 131 and Figure 134). This necklace may be a status marker, indicating inherited social ranking at Cedar Grove as well as at Belcher. The other conch shell beads found at Cedar Grove also have counterparts at Belcher. Two of the burials, 6 and 9, also had shell ear pendants (see Chapter 13), but no equivalent ornaments were found at Belcher.

Of the four undisturbed burials, Burial 8 was within a more recent portion of the historic cemetery which was probably intended for future burials when the 1927 flood covered it over. The other three undisturbed burials, 7, 9, and 10, were under the historic levee. That Burial 9 was undisturbed is most important, as potential evidence of European contact was found in that grave among the materials recovered in flotation. This consisted of two circular bone fragments, both broken, one with a single hole, and the other with two holes. These two bone pieces are interpreted as buttons, a technological concept which I believe the Caddo must have gotten from Europeans (cf. Chapters 13 and 18).

GRAVE GROUPS

An attempt was made to divide the horizontal spatial distribution of the aboriginal graves into subgroupings. This was done primarily on the basis of their visual geographical proximity and later reinforced by some other artifact and grave orientation associations. Group A in the indirect impact zone (Figure 10-1) consisted of children's Burials 13 and 15 within Caddo Structure 1. In the indirect impact zone, Group B, Burial 1, was another child within the postulated Caddo Structure 2. Group C was the largest, consisting of five closely grouped graves in two rows west to east, the southern row was Burial 3, 10, and 9, and the northern row was Burial 4 and Burial 7. To the west of this tight group, two other burials were almost in the same rows, with Burial 5 on the south and Burial 6 to the north. Burials 8 and 14 were grouped on the basis of their both having pottery assemblages that appeared slightly earlier than those of the other graves. Their grave orientations also seemed to be aligned along a common axis in a single row. This was called group E. Group D consists of the other two outlying adult burials, numbers 11 and 12. Burial 16, discovered in 1982, was assigned to Group F, corresponding to the postulated interior of Caddo Structure 3.

Since grave pit orientation was not dependent on whether the graves were intact a statistic was developed to permit a test among the different adult groups to see if there were any significant differences in their orientations. The orientations of the burials (Table 10-2) were transformed into the "sorient" as outlined by Lynne Goldstein (1980).

> The sorient transformation attempts to alleviate the following problem: If one takes the mean of several orientations, the mean will not necessarily reflect the orientation of the majority of the burials. For example, 1° and 359° are close to each other, yet the mean of the two is 180°. Sorient collapses the circle to differentiate primarily between north and south . . . . Sorient is a sine transformation distributed between 0 and 1 (Goldstein 1980:55-56; emphasis in original).

This statistic is appropriate for the adult burials at Cedar Grove because they were all oriented to the northern quadrants (Figure 10-18). According to Goldstein's calculations Sorient is calculated by using the following formula: Sorient= sin (0.00872664625 orient), where orient is the orientation in degrees: 0° orient 360°. The results of the sorient calculation and the group sorient statistics are given in Table 10-2b,c.

Using these data the groups were compared with a t test for two null hypotheses, first that 1 = 2 and then that 1 = 2 . These tests were done at the .10 level of significance with a two tailed test. The results of these tests are given in Table 10-2c. The test formula used was taken from Dixon and Massey (1969). These tests showed no significant differences between the Sorient of the various groups, and the variation was therefore, probably related to time of year and/or time of day that the burials were made, when the sun's position could have caused a slight difference in how the Caddo oriented themselves when digging the grave pits. Within groups C and E it was obvious that grave orientation was in relation to each other.

Further proofs of the validity of these burial groups was made after completion of the analyses of the ceramics, bone/shell artifacts, and faunal materials. The distribution of the grave groups and the Caddo IV/V midden overlying them reveals perspectives on Caddoan attention to the interment of the dead. First, there was no reburial or overlapping of any Caddo IV/V graves. Subadults were interred inside houses, through the floor, as opposed to adults who were placed in plots adjacent to the structures. Graves were probably identifiable loci protected from disturbance during the occupation of the site. However, as midden deposits covered the burials within a relatively short time (less than 60 years maximum occupation; see Chapter 11), it is also possible that the recognition of the graves did not preclude infringement by daily activities and debris. Clearly death was marked as an important rite of passage among the Caddo and they believed in some kind of afterlife in which the deceased retained their individuality. Food, tools, and personal items of adornment were buried with the dead reflecting the status of their owners in life.

Table 10-2. Aboriginal grave pit orientation statistics

a. Burial	Orient (°E of N)	Sorient
1	3	Subadult
3	26	.2280
4	25	.2182
5	38	.3240
6	38	.3240
7	50	.4259
8	53	.4439
9	21	.1790
10	24	.2085
11	21	.1790
12	10	.0899
13	356	Subadult
14	57	.4794
15	flexed	Subadult

b. Group	Burials	N	$\overline{X}$	scl
C	3-7, 9-10	7	.2725	.0819
D	11,12	2	.1345	.0447
E	8,14	2	.4617	.0173

c.	Group	Degrees of Freedom	t
σ_1	C and D	7	.0685
	C and E	7	.0584
	D and E	2	.0480
σ_2	C and D	7	.0557
	C and E	7	.0640
	D and E	2	.0480

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Chapter 11

A DESCRIPTION AND ANALYSIS OF THE CERAMICS

Frank F. Schambach and John E. Miller

INTRODUCTION

This report is a description and analysis of all ceramics obtained during the Fall 1980 salvage excavations of the main part of the Cedar Grove site, the locus of the basically Caddo V period "Component 2" described in our preliminary report (Schambach et al. 1982). Our study of this larger and in many respects superior ceramic collection both confirms our preliminary conclusion that "Component 2" represents a single short Caddo V period occupation by people of the Chakanina phase and permits certain significant refinements of it. We believe we can now see that this occupation was begun late in the Caddo IV period by people with a Belcher phase ceramic assemblage (a possibility that we anticipated in our preliminary report). During this occupation, the Belcher phase assemblage evolved into a Chakanina phase assemblage through many incremental changes in modes of manufacture and decoration within various pottery types. To judge from still exiguous data on the "absolute" dates of a few Caddo IV and V ceramic types and modes, this seems to have taken place during an archeologically brief time span of about 60 years, most probably between 1670 and 1730. The opportunity to observe very fine grained ceramic changes within such a short time period is, to us, the most exciting and significant aspect of this study. Regardless of the uncertainties still involved, this is the first opportunity we have had to even attempt to study changes in Caddoan ceramics on something nearer to an emic time scale than to a geological one.

A small collection of sherds from another sondage of "Component 1," the deeply buried Caddo III to early Caddo IV component described in our preliminary report (Schambach et al. 1982:143-144) was submitted to us for study along with the main Cedar Grove collection. Since this pottery is from a context spatially and temporally distinct from the main body of the site--practically a separate site located southeast of Cedar Grove and dating no less than 150 years earlier than it--we are presenting our brief description and analysis of it separately in Appendix VIII. Nothing but confusion would result from mixing the description and discussion of that collection with this one. For the sake of clarity in the regional literature, we do permit it to intrude on this report to the extent that we label it the "Cedar Grove I" component. This makes the two components described at length in this report "Cedar Grove II" and "Cedar Grove III."

GENERAL CHARACTERISTICS OF THE COLLECTION

The collection consists of a "mortuary collection" of 67 vessels or large parts of vessels from twelve grave lots (seven of them possibly incomplete, see Table 11-12) and 9,262 "potentially sortable" sherds from the middens and nonmortuary features. The "potentially sortable" sherd collection consists of all sherds larger than 12 mm across. All sherds smaller than 12 mm across (that is, all those that passed through a 12 mm mesh screen during the preliminary sorting stage of laboratory processing) were excluded from analysis as being too small to yield reliable information on ware, temper, or decoration. This is standard procedure in our laboratory. Of the potentially sortable sherds, 1,233 were set aside because the surfaces were missing, or too worn, or too eroded for analysis. Another 355 had to be set aside because they had unreadable catalog numbers. Thus the potentially sortable collection of 9,262 sherds was reduced to a sortable collection of 7,674 sherds.

WARES

It is standard practice in Caddoan ceramic typology to distinguish fine wares from coarse wares (Krieger 1944; Suhm and Jelks 1962; Webb 1959; Schambach et al. 1982). The sortable sherd collection is 54.69% fine ware (4,197 sherds) and 45.31% coarse ware (3,477 sherds). The whole vessel collection is 67% fine ware (45 vessels) and 32% coarse ware (22 vessels) but because of the problem of incomplete grave lots, these figures cannot mean much.

GENERAL OBSERVATIONS ON TEMPER

About 86% of all the coarse ware sherds are shell tempered while temper is not visible in roughly 75% of the fine ware sherds. Specifically, 85.95% or 2,989 of the 3,477 coarse ware sherds are shell tempered. Another 6.5%, or 228 sherds, are grog tempered. A final .66%, or 23 sherds, are bone tempered. Temper is not visible in 6.82%, or 237 sherds.

It is almost pointless to check Caddoan fine ware sherds for temper because the temper particles will normally be too small to be visible, or at any rate identifiable, even under magnification. Basically, that is what makes this pottery fine ware, although surface finish, decoration, and vessel form also figure in. To demonstrate this, we checked 1,455 sherds. This figure includes all the decorated sherds plus all the undecorated rim sherds, neck sherds, and red slipped sherds (Table 11-10) and some undecorated sherds. We obtained the following results. Temper was not visible in 1058 sherds or 73.83% of the collection; 142 sherds (9.91%) were shell tempered, 15.91% (228 sherds) were grog tempered and 0.35% (or five sherds) were bone tempered.

For each of the 4,910 sherds that were checked for temper, our procedure was identical. First a small piece somewhere along the edge of the sherd was broken off, using needle nosed pliers. Then the fresh breaks were examined under a 10X illuminated magnifying glass for shell particles or for the holes and the platy, laminated appearance that is characteristic of sherds that have had shell temper leached or burned out of them.

Twenty-one (95%) of the 22 coarse ware vessels in the mortuary collection were shell tempered. The shell was

easy to see in all vessels, both on cleaned edges of sherds of broken vessels before restoration and on unbroken surfaces of vessels that were collected intact.

The problem of identifying temper in fine wares is compounded in whole vessels since there are no broken edges to examine. We had the foresight to check all broken but restorable vessels for temper before gluing them back together. But with specimens that were collected intact, we only examined the surfaces, choosing not to drill into or break them to obtain data of dubious value. The following figures probably represent this as much as anything. Twenty-one of 45 fine ware vessels (47%) were shell tempered. Twenty-four (53%) were either grog tempered, or were unbroken and did not show any shell temper on the surface.

EVIDENCE OF USE AND RECYCLING OF VESSELS

When the 67 vessels of the mortuary collection arrived in the laboratory, they were allowed to dry to the point where they could be handled without crumbling. Then they were brushed clean with soft brushes rather than washed. This was to avoid destroying pigments, carbon coatings, food remains, or other residues. Fortunately, the soil in the graves at Cedar Grove was sandy. This made it easy to remove without taking possible coating and residues with it, or scrubbing away slight indications of use or wear.

We found coatings (other than pigments rubbed into lines for decoration) or residues, usually soot, on five vessels. We found use marks, usually slight damage or wear on rims, on four. (Table 11-1, and see the vessel descriptions for details.) We found nine instances of "recycling." "Recycled" is our term for vessels that were damaged in use, but were then substantially modified so they could be kept in service, and ultimately used as grave goods. A good example is Foster Trailed-Incised vessels that have had their rims trimmed down to remove a cracked or broken place. (Figure 11-18d, a Foster Trailed-Incised jar from Grave Lot 4, Burial 5). There are three of these. Also, there are three bases of large plain bottles or coarse ware jars recycled, apparently as platters or bowls, a Karnack Brushed Incised jar recycled as a bowl or platter, a Belcher Ridged jar recycled as a bowl or platter and a Belcher Engraved bowl, broken, trimmed down and kept in use.

We prepared Table 11-1 to see if we could detect any patterning between the different evidences of use and recycling and variables such as vessel type and age and sex of the owner. Nothing seems to leap out with respect to these particular variables, other than that the young male in Burial 7 had all recycled vessels. We can speculate at length about why this is so: Was this person a slave or servant? A mendicant of some kind? A widower? An unmarried man too feckless to get himself good pots? But this is as far as we can go without some additional archeological or ethnographic data to guide interpretation. The obvious question is, does this mark a recognized status in late Caddo society? To answer that we need to see more late Caddo grave lots from other small sites like Cedar Grove.

What does leap out is a 100% association of recycling--as opposed to use marks and residues--with Ceramic Group 3 grave lots (which we assign to the Caddo V period, Chakanina phase, Cedar Grove III component, see below). All nine occurrences of recycled vessels were in Ceramic Group 3 graves (Burials 3, 5, 7, and 10) and all Ceramic Group 3 grave lots include at least one vessel that has obviously been used, if not actually recycled.

In our experience, any evidence of use, to say nothing of recycling, of Caddo vessels is rare. This could be partly

Table 11-1. Use marks, residues and evidence of recycling on the mortuary vessels

Grave Lot	Burial Number	Ceramic Group	Age and Sex of Individual	Vessel Number	Vessel Type and Description	Use Marks	Residue	Recycling
1	B1,2	3	Infant, 12-18 mos	1	Bird effigy			
				2	Hodges Engraved, var. Sentell bowl			
				3	Karnack Brushed Incised jar			
				4	Small incised bowl			
				5	Small engraved jar			
2	B3	3	Female, 45-49 yrs	1	Keno Trailed Incised, var. Phillips beaker			
				2	Plain sherd			1
3	B4	3	Female, 20-24 yrs	1	Hodges Engraved, var. Armour bowl			
				2	Hodges Engraved, var. Armour bowl			
				3	Hodges Engraved, var. Candler bottle			
				4	Hodges Engraved, var. Armour bowl			
				5	Avery Engraved bowl			
				6	Foster Trailed-Incised, var. Shaw jar			
4	B5	3	Male, 35-39 yrs	1	Keno Trailed, var. Phillips beaker			
				2	Natchitoches Engraved var. Lester Bend bowl			
				3	Keno Trailed var. Glendora bottle			
				4	Belcher Engraved, var. Owen bowl			
				5	Foster Trailed-Incised jar			2
5	B7	3	Male, 20-24 yrs	1	Belcher Ridged jar			2
				2	Foster Trailed-Incised jar			2
				3	Karnack Brushed-Incised jar			3
				4	Large bottle fragment			1
				5	Belcher Engraved, var. Owen bowl			3
6	B8	1	Male, 35-39 yrs	1	Foster Trailed-Incised, var. Foster jar	a	a1	
				2	Belcher Engraved, var. Ogden bottle	b		
				3	Belcher Engraved, var. Belcher bowl			
				4	Belcher Engraved, var. Ogden bottle	c		
				5	Belcher Engraved, var. Belcher bowl			
				6	Belcher Engraved, var. Belcher bowl			

Table 11-1. Use marks, residues and evidence of recycling on the mortuary vessels

Grave Lot	Burial Number	Ceramic Group	Age and Sex of Individual	Vessel Number	Vessel Type and Description	Use Marks	Residue	Recycling
7	B9	3	Male, over 50 yrs	1	Cabaness Engraved bowl			
				2	Cabanese Engraved bowl			
				3	Hodges Engraved, var. Kelly's Lake bottle		a2	
				4	Engraved bottle, type unknown			
				5	Hodges Engraved, var. Candler bottle			
				6	Foster Trailed-Incised, var. Moore jar		a3	
				7	Foster Trailed-Incised, var. Moore jar			
				8	Engraved bowl, type unknown			
				9	Foster Trailed-Incised, var. Dixon jar		a4	
				10	Keno Trailed, var. Scott's Lake jar			
				11	Hodges Engraved, var. Sentell bowl			
8	B10	3	Juvenile, sex undetermined, 12-15 yrs	1	Natchitoches Engraved jar			
				2	Hodges Engraved, var. Shaw jar			
				3	Foster Trailed-Incised, var. Shaw jar			
				4	Belcher Engraved, var. Owen bowl			
				5	Foster Trailed-Incised, var. Moore jar			
				6	Untyped base of large bottle			1
				7	Foster Trailed-Incised, var. Finley jar			
				8	Natchitoches Engraved, var. Lester Bend bowl			
				9	Belcher Engraved, var. Owen bowl			
				10	Foster Trailed-Incised, var. Dixon			2
9	B11	2	Female, 45 yrs	1	Karnack Brushed-Incised, var. Fish Bayou jar			
				2	Foster Trailed-Incised, var. Red Lake jar			
				3	Keno Trailed bottle			
				4	Foster Trailed-Incised, var. Dobson jar			
				5	Hodges Engraved, var. Candler bottle			
10	B12	2	Male, 30-34 yrs	1	Hodges Engraved, var. Armour bowl			
				2	Belcher Engraved, var. Owen bowl			
				3	Karnack Brushed-Incised, var. Karnack jar			
				4	Foster Trailed-Incised, var. Dobson jar			
				5	Glassell Engraved, var. McGee bowl			
11	B14	1	Male, 35-39 yrs	1	Avery Engraved, var. Graves bowl			
				2	Karnack Brushed-Incised, var. Karnack jar		a5	
				3	Belcher Engraved, var. Ogden bottle			
				4	Foster Trailed-Incised, var. Foster jar			
				5	Belcher Engraved, var. Belcher compound bowl		a6	
12	B15	2	Child, 6 yrs	1	Keno Trailed, var. McClendon bottle			
				2	Karnack Brushed Incised, var. Karnack jar			

a: thermal reddening, cooking pot?
b: black fire clouding, thermal reddening, cooking
c: chipped lip
a1: soot
a2: white substance; ; calcium carbonate?
a3: interior, portions of exterior coated with soot
a4: heavy coating of soot over interior
a5: red pigment
a6: upper two-thirds coated with soot
1: bottle fragment to platter
2: trimmed down rim; jar to bowl
3: beaker to bowl

because so many of the vessels we work with are in large old private collections of select specimens, collections made 30 years or more ago when pothunters left damaged vessels behind in the graves. To look at most of these collections one would think that Caddo pots never were cracked or broken after burial either. On the other hand, we have worked with enough unculled pottery, including some from our own excavations (Schambach 1972) to be fairly certain that recycling was not common prior to the Caddo V period. But from the looks of the Ceramic Group 3 graves at Cedar Grove--the first of this period that have been professionally excavated in Arkansas--it may have been common throughout some or all of the Caddo V period. Of the several possible explanations for this, the one we favor at the moment is that this is evidence of the demographic stress the Caddo were under around A.D. 1700. European diseases were rife, populations were dropping and there was a shortage of potters and pots.

INCOMPLETE GRAVE LOTS

As Table 11-12 indicates, seven of the twelve grave lots that produced the mortuary collection must be considered possibly incomplete. Mostly this is because the Caddo graves were intruded on to some degree by burials belonging to the nineteenth and twentieth century Cedar Grove cemetery. Some burials were more extensively disturbed than others. The extent of the damage is noted, case by case, in our descriptions of the grave lots. Grave Lots 1, 2, 4, 9, 10, and 11 are probably missing some vessels because the disturbance was extensive. Only Burial 4 was so slightly disturbed that the grave lot it contained (No. 3) can probably be considered complete despite the disturbance.

It is a pity that this happened, but it is a fact of archeological life that every site and every collection has particular problems that we must deal with somehow. In this case, the main thing is to keep in mind that as large as some of these grave lots are, they are still almost certainly incomplete. We have tried to do this and make the necessary allowances for it in our analyses and interpretations. We hope we have not let it mislead us on some key point. Because the mortuary collections and the sortable sherd collection are so similar (Table 11-11), and both collections are large, we believe that the missing vessels just about have to be mostly vessels of the types and varieties present on the site.

POSTDEPOSITIONAL DAMAGE TO AND REPAIRS ON VESSELS

Very few vessels arrived at the lab intact. Most required some reconstruction. This was limited to gluing sherds back together. We did not reconstruct missing pieces or designs. The only adhesive used in repairs was Elmer's Glue (TM) diluted to 20% with tap water.

The repair work required several hundred hours. It alone would have exhausted the sum allocated for ceramic analysis on this project. Fortunately we were able to turn to well trained members of the Kadohadacho Chapter of the Arkansas Archeological Society for assistance in this work. Most of it was done by David Jeane, Vernon Perry, David Perry, Blan Ellis, Jr., Mrs. Blan Ellis, Sr., Tommy Cheatham, and Jim Lenz. (Jeane and Cheatham also assisted with various aspects of the ceramic analysis.)

Many vessels from ostensibly undisturbed contexts have small pieces missing, as the photographs show. This is not the result of sloppy excavation and recovery techniques. Nor is it the result of use or of ritual "killing" of vessels before they were put in the graves. It is due to gopher activity. In the Red River Valley gophers colonize the same patches of well drained sandy soils favored by the Indians. When gophers burrow up against pottery vessels they attempt to chew or scratch their way through them. Rarely, if ever, do they actually chew their way through, but they often dislodge sherds from cracked or crushed vessels. These they remove to side chambers in their burrow systems, often completely out of the grave where we would not normally recover them.

EVIDENCE OF TWO CERAMIC SERIES

Two partially distinct series of pottery are recognizable in the whole vessels in the mortuary collection. We refer to these as the "adult series" and the "child series." The adult series comes from the graves of adults and teenagers. It consists of the normal range of types and varieties for the Caddo IV and V periods in the Great Bend region. The child series comes from the graves of infants and young children, apparently all of them less than 10 years old. This consists mainly, if not exclusively, of very small vessels. Many of these are miniatures, meaning they are much too small for normal use. They were probably toys, or perhaps scaled down token grave offerings. Besides the trend to small size, the child series seems to run heavily to types and varieties not seen in the adult series, and there seems to be a high percentage of effigy vessels. Finally, there seems to be a certain looseness in the technical realm. It looks as if the choice of tempering was not always in accord with adult standards. Also the surface finish and decoration are sometimes not up to adult standards. Sometimes decoration is different from anything known in the adult series. This may be due to looseness in execution of adult series designs. On the other hand, these apparently deviant vessels may belong to distinctive child series types or varieties that are never found in the adult series.

At the moment we cannot do much with this distinction other than note it as a possible explanation for some of the variation we see in Caddo ceramics. We probably do not yet have the grave lot data we would need to break our existing collections of southwest Arkansas pottery down along these lines, nor is this the place to try it. We do note though that some of these same tendencies were observed in infant graves from the Belcher Mound (Webb 1959:Figure 59, Burial 3; Figure 78, Burial 14; Figure 97, Burial 23), suggesting that our notion of two series could be clarified and perhaps confirmed as more data come in.

PRELIMINARY REMARKS ON CLASSIFICATION AND DESCRIPTION

In our classification of this pottery we use a modified version of the standard Caddo area "type system," for classifying whole vessels that was originally developed by Alex Krieger and C. H. Webb. The references for most of the types set forth in this system are The Handbook of Texas Archeology (Suhm and Jelks 1962) and Webb's The Belcher Mound (1959).

Since Cedar Grove and the Belcher Mound are close to each other in both space and time, we have had the advantage of working primarily with Webb's well thought out types. Therefore, we had few problems in classifying the whole vessels to the level of types. Those problems that we did have had mostly to do with refining the existing types. These were easily solved by introducing into the Krieger-Webb type system the concept of varieties as it has been developed by Philip Phillips in the Lower Mississippi Valley (Phillips 1970).

We have created 30 new varieties to handle the range of apparently significant variation that we find in the mortuary collection. We had to create so many because this is the first major study of Caddo IV and V period pottery in the Great Bend region in the 23 years since the publication of C. H. Webb's analysis of the Belcher Mound ceramics. Since then a great deal of pressure has built up for finer units of ceramic analysis. For example, as we show in this report, it is only by recognizing varieties within the major types at Cedar Grove that we can clearly

distinguish the late Caddo IV Belcher phase component (Cedar Grove II) from the early Caddo V Chakanina phase component (Cedar Grove III).

Our new varieties are based not just on the 67 Cedar Grove vessels and a standard survey of vessels in the existing literature but also on comparison of the Cedar Grove vessels with 1,209 Caddo vessels of all periods from the Great Bend region in Arkansas. These are all vessels that are represented in our photo files and research collections. The majority, 697 of them, are from sites that are near neighbors of the Cedar Grove site within the Spirit Lake locality (Schambach et al. 1982). Another 273 came from the Boyd Hill locality, just upriver from the Spirit Lake locality. Among the 960 vessels from these two localities are 167 specimens of the types and new varieties present at Cedar Grove (Table 11-2). Thus our working sample for typological purposes is 234 whole vessels rather than 67.

When we finished classifying the whole vessels and turned to the sherds, we encountered the classic problem in Caddo ceramic typology. This is the problem of the tremendous waste of data that occurs when one attempts to use the Krieger-Webb typology, which is a whole vessel typology, on sherds. Only 1,636 of the 7,674 sortable sherds could be typed, just 21%. Actually this figure is on the high side. This is an easy collection. The average for all Caddo sherd collections that we have handled seems to be about 10%. Krieger found that only 12% of the 96,000 sherds from the Davis site could be typed (Newell and Krieger 1949:77). The main reason the Krieger-Webb system is so weak on sherds (when it is used properly) is that it was the nearly universal practice of Caddo potters to use different designs and, frequently, different decorative techniques on the rim and body of the same vessel. *In our study of the Cedar Grove mortuary vessels we learned that it was even permissible for Caddo potters to use different*

Table 11-2. Distribution of Cedar Grove pottery types in the Spirit Lake and Boyd Hill localities (whole vessels only)

	Spirit Lake										Boyd Hill			
Type	Cedar Grove	Lester	Battle	Handy	McClure	Joe Russel	Cabaness	Spirit Lake(1)	Spirit Lake(2)	Friday	Foster	Shaw	Cryer	Henry
Avery Engraved														
<u>var. Graves</u>	1													
<u>var. Bradshaw</u>		1	2											
<u>var. Baker</u>														
Belcher Engraved														
<u>var. Belcher</u>	4		8	5						1				
<u>var. Owen</u>	5	4												
<u>var. Soda Lake</u>		7	4	1						1				
<u>var. Ogden</u>	3	1	2											
Belcher Ridged														
<u>var. Belcher Ridged</u>		1				1								
<u>var. Wilson's Island</u>		3												
var. undeterminable	1		1											
Cabaness Engraved	2	1	1				1							
Foster Trailed-Incised														
<u>var. Foster</u>	2	6	2		1	1				1	7		1	
<u>var. Dobson</u>	2		3											
<u>var. Red Lake</u>	1	4	2											
<u>var. Dixon</u>	2	1	1										1	
<u>var. Moore</u>	3					3								
<u>var. Finley</u>	1													
<u>var. Shaw</u>	2					1			1					
Glassell Engraved														
<u>var. Atkins</u>		3									2			1
<u>var. McGee</u>	1	1	1									1		
var. unknown		1	1					1						
Hodges Engraved														
<u>var. Armour</u>	4			1										
<u>var. Sentell</u>	2	1	3			1		1	1					
<u>var. Kelly's Lake</u>	1													
other varieties														
Karnack Brushed-Incised														
<u>var. Karnack</u>	3	3												
<u>var. Fish Bayou</u>	1		1								1			
var. unknown	2	2		1	1	1								
Keno Trailed														
<u>var. McClendon</u>	1	2	1											
<u>var. Phillips</u>	2													
<u>var. Glendora</u>	1	1												
<u>var. Scott's Lake</u>	1		4											
var. undeterminable	1													
new unnamed varieties		5	2		2	1				1				
Natchitoches Engraved													1	
<u>var. Lester Bend</u>	2	3	2			1								
var. unknown (bowls)	1					2			1					
var. unknown (bottles)						1			1					

colored pigments on the rim and body of the same bowl. For example, Vessel 5 from Grave lot 10, Burial 12, a Glassell Engraved bowl, has red pigment in the lines of the rim decoration and white pigment in the lines of the body decoration.

With this problem, of course, it does no good to resort to the type-variety system. What cannot be typed cannot be put into varieties either. The waste factor always increases astronomically when it comes to sorting sherds to the variety level. In the present case, only 74 of the 802 typed fine ware sherds and 23 of the 834 coarse ware sherds could be assigned to varieties.

This is not a new problem for us and we have been involved for several years now with working out a solution (Schambach 1981:106-114). This is a completely new descriptive classification system designed to handle sherds as well as whole vessels. This system can be used alone or as we use it here, as a backup for the type-variety system, to describe, quantify, and discuss the sherds that cannot be typed. We also use it in describing and discussing the designs on the typed material. But since we have kept it in the background in this report, choosing to make the basic presentation of the data in the text and tables in terms of the old system, a lengthy description of it should not be necessary here either (one can be found in Schambach 1981:106-147).

Briefly, it consists of a hierarchical listing by "class," "pattern," and "design" of every rim and body design known to occur on pottery in southwest Arkansas (based on a collection of about 8,000 photographs of whole vessels). "Classes" are based on decorative techniques, (i.e., incising, engraving, punctation, brushing, etc.) and certain broadly defined motifs. "Patterns" are groups of similar designs within classes. "Designs" are recurring variations within patterns.

Designs are always referred to by a name and a number (e.g., Babson 3, Blackburn 1, etc.) and it is always specified whether they are rim or body designs. Since there is no published key as yet, all rim and body designs found on pottery from Cedar Grove are illustrated in alphabetical order in Figures 11-1 to 11-9. When we refer to a rim design or a body design (by name and number e.g. Babson 3) the reader has only to look it up there (keeping in mind that rim and body designs are illustrated separately) to see exactly what we are talking about.

Patterns are referred to by a name only (again always with some indication whether they are rim patterns or body patterns). When we refer to a pattern (e.g. the Babson body pattern) the reader can turn to Figures 11-1 to 11-9 to see what we mean. (Obviously, we have not illustrated all the known designs within particular patterns, only those found at Cedar Grove.)

TYPOLOGY OF THE CEDAR GROVE POTTERY

All 67 of the whole or partial vessels from the graves and 1,636 of the 7,674 sortable sherds from the excavation units and nonmortuary features are classified into 10 types (Tables 11-12, 11-3, and 11-4). Nine of these are recognized Caddo area types. One, Cabaness Engraved, is new. These 10 types are further divided into 30 varieties, all of them new.

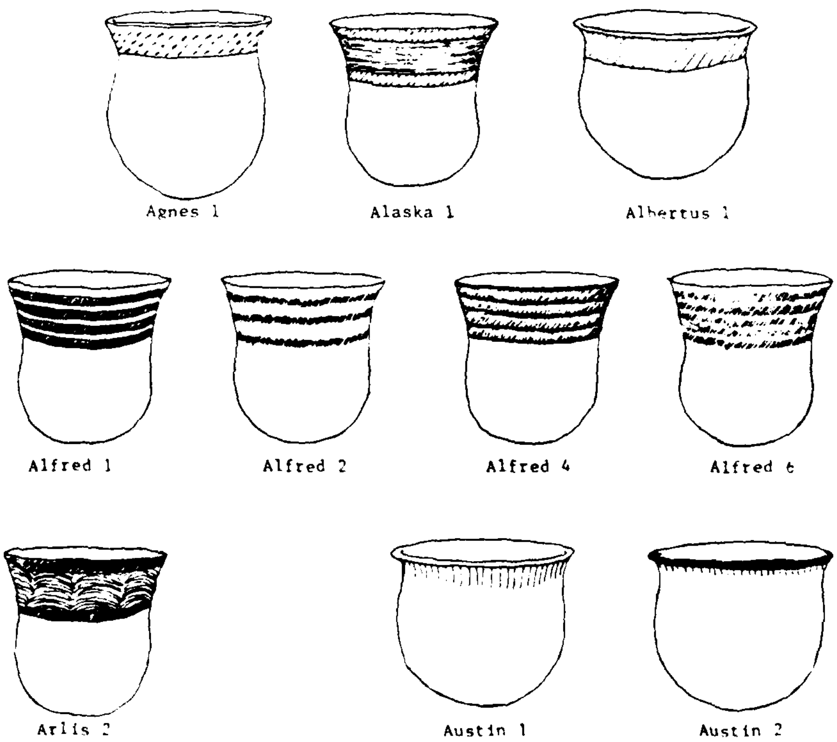


Figure 11-1. Class A rim designs found on pottery from Cedar Grove

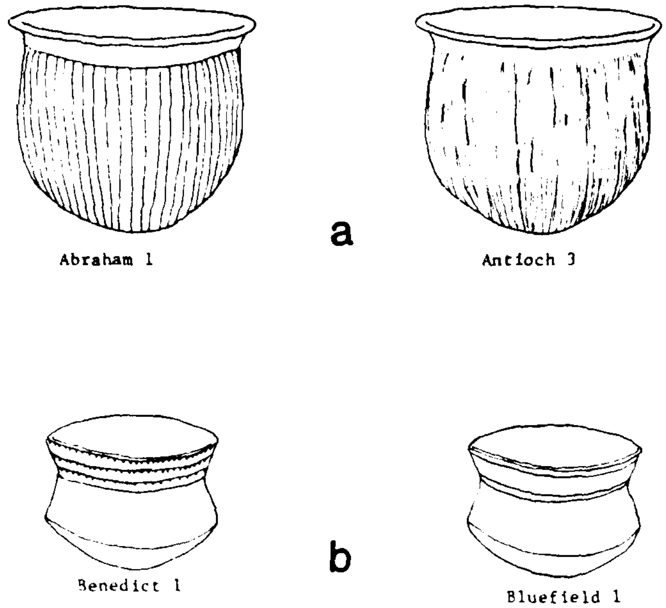


Figure 11-2. a. Class A body designs found on pottery from Cedar Grove; b. Class B rim designs

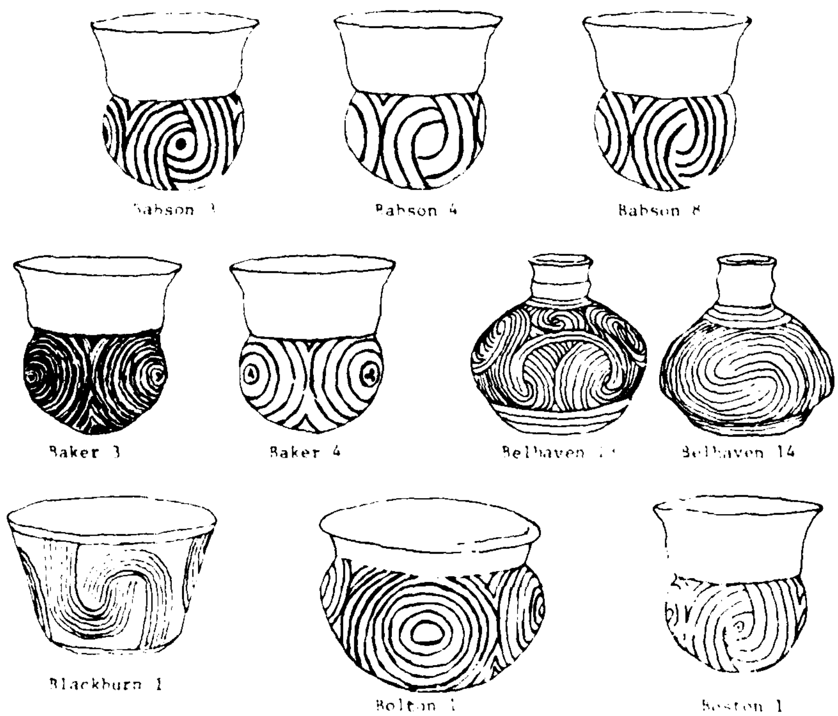


Figure 11-3. Class B body designs found on pottery from Cedar Grove

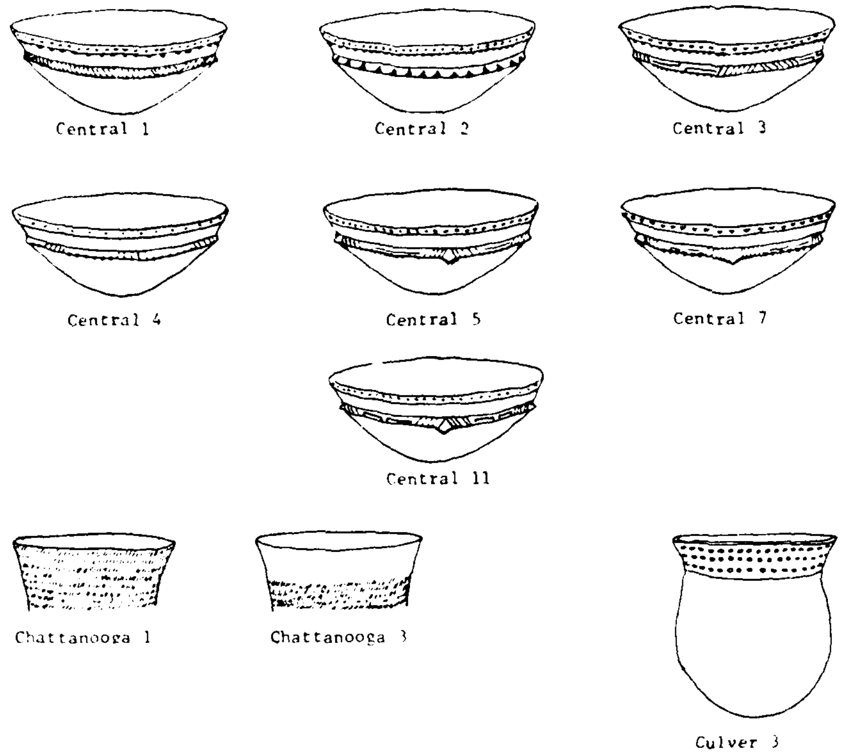


Figure 11-4. Class C rim designs found on pottery from Cedar Grove

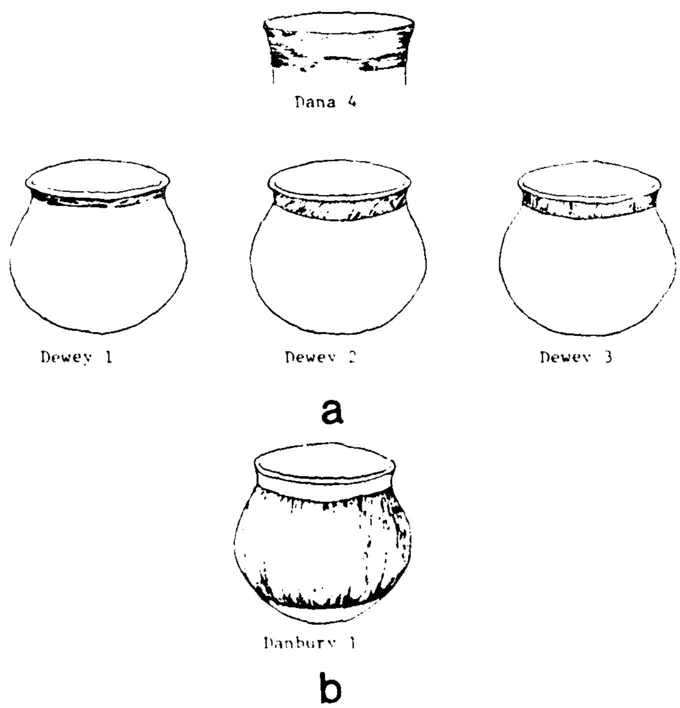


Figure 11-5. a. Class D rim designs found on pottery from Cedar Grove; b. Class D body designs

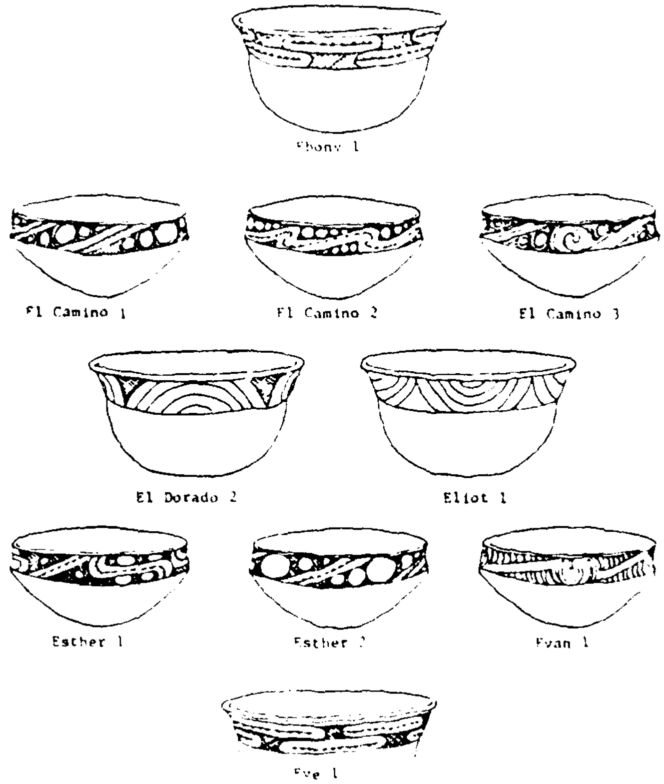


Figure 11-6. Class E rim designs found on pottery from Cedar Grove

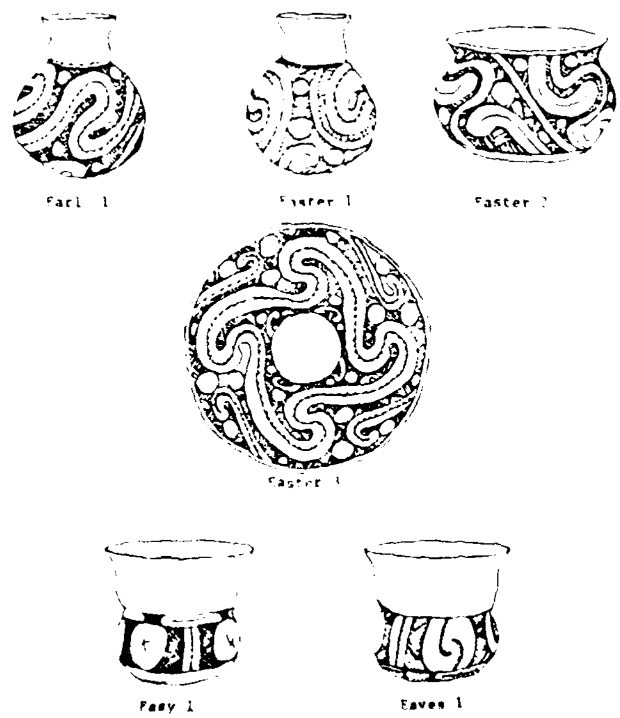


Figure 11-7. Class E body designs found on pottery from Cedar Grove

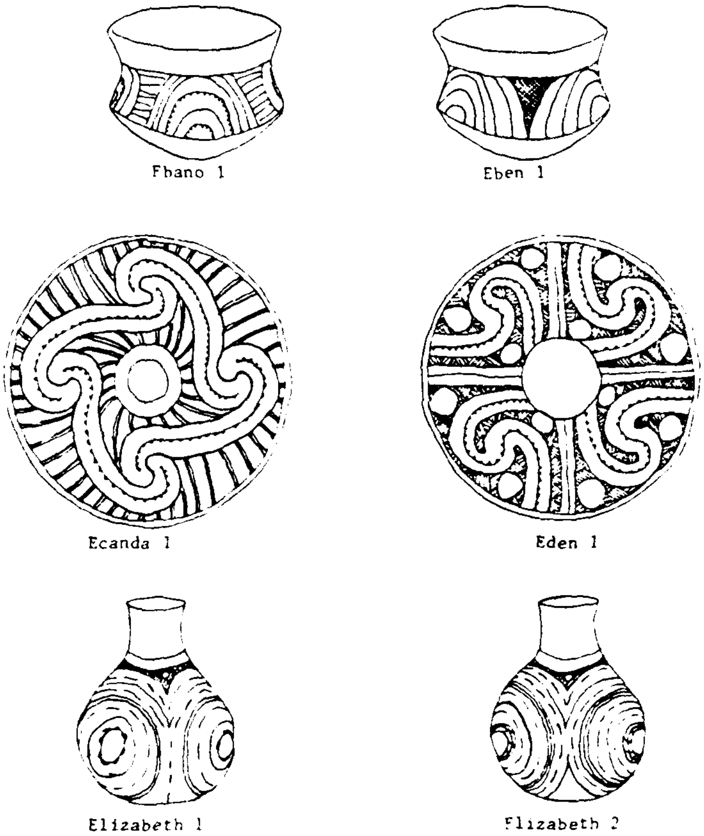


Figure 11-8. Class E body designs found on pottery from Cedar Grove

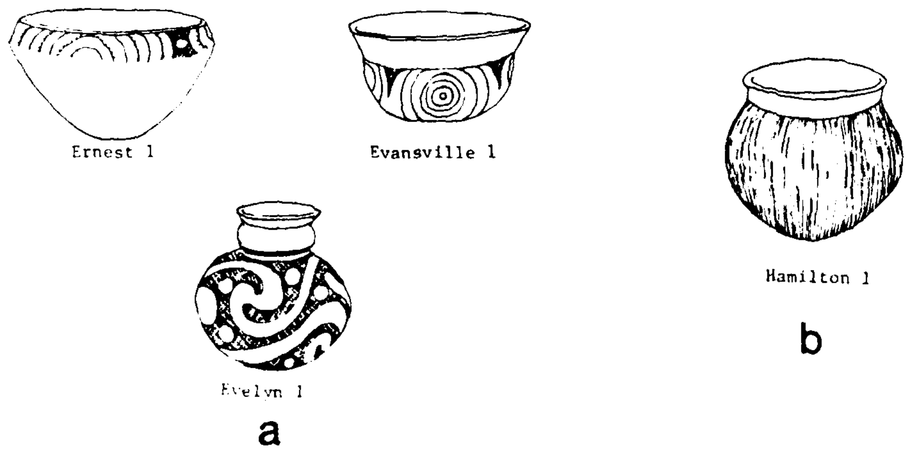


Figure 11-9. Class E (a) and Class H (b) body designs found on pottery from Cedar Grove

Table 11-3. Breakdown of decorated pottery in the Cedar Grove sherd collection

Types or Descriptive Categories	Number of sherds	% of sortable sample (7,674)	% of decorated sherds (3,594)	% of decorated fine ware (1,327)	% of decorated coarse ware (2,267)	% of fine ware (4,197)	% of coarse ware (3,477)
Avery Engraved	9	.12	.25	.68		.21	
Belcher Engraved	80	1.04	2.22	6.03		1.91	
Glassell Engraved	1	.01	.03	.08		.02	
Hodges Engraved (bowls)	72	.94	2.00	5.43		1.72	
Keno Trailed	346	4.51	9.63	26.07		8.24	
Natchitoches Engraved (bowls)	89	1.16	2.47	6.71		2.12	
Hodges/Natchitoches (bottles)	205	2.67	5.70	15.45		4.88	
Untypable decorated fine ware	494	6.44	13.74	37.23		11.77	
Miscellaneous decorated fine ware	31	.40	.86	2.34		2.07	
Belcher Ridged	325	4.23	9.04		14.34		9.35
Foster-Trailed Incised	501	6.53	13.93		22.10		14.41
Karnack Brushed-Incised	8	.10	.22		.35		.23
Untypable decorated coarse ware	1433	18.67	39.87		63.21		41.21

Table 11-4. Decorated fine ware sherds classifiable to type and variety

	Avery Engraved			Belcher Engraved				Glassell Engraved	Hodges Engraved			Keno Trailed		Natchitoches Engraved			Natchitoches/Hodges Engraved
Temper	Bradshaw	Graves	Undeterminable	Soda Lake	Ogden	Owen	Undeterminable	Undeterminable	Armour	Sentell	Undeterminable	Phillips	Undeterminable	Lester Bend	Natchitoches	Unknown (red slipped)	Undeterminable
Shell	1		1			3	6				2	1	57	2	1	1	13
Grog		1			1	6	9			1	18		57	5	1	1	23
Bone										2	1						
Not visible			6	1	1	12	41	1	3	2	43		231	15	14	49	169
Total	1	1	7	1	2	21	56	1	3	5	64	1	345	22	16	51	205

Avery Engraved

C. H. Webb (1959:142) described Avery Engraved as a type "featuring circles and semicircles on shouldered bowls." Suhm and Jelks (1962:1) emphasized that it centers around semicircular motifs. As it is generally understood, this type contains at least five potential varieties. Three of these are sufficiently well represented by whole vessels from Cedar Grove and other sites in the Spirit Lake locality to require naming in this report.

Our new Graves variety appears on globular bowls with short flared rims. The rim decoration consists of nested semicircle designs with crosshatched backgrounds (of the El Dorado or Elliot pattern; Figure 11-6) and the body decoration consists of concentric circle designs with crosshatched or hatched backgrounds (our Evansville pattern; Figure 11-9, Figure 11-38a).

Vessels of this group have had unofficial status as a variety for some time, but were not named (Webb 1959:142; Figure 120b). Webb (1959:142-144) states that they could be assigned to Belcher Engraved almost as easily to Avery Engraved, because of the concentric circle design on the bodies. He also states that he and Krieger called them Belcher Engraved originally, but later they switched them to Avery Engraved in order to keep Belcher Engraved as pure as possible. There is a hybrid Belcher-Avery vessel (var. Belcher) from the Lester Place (Arkansas Archeological Survey negative number 695133) that consists of a Belcher Engraved bowl (var. Belcher) attached to what would have to be called an Avery Engraved var. Graves body. This suggests that Webb and Krieger's first choice may have been the best one. Nevertheless we see Webb's point about not cluttering up Belcher Engraved. Avery Engraved is already cluttered; eventually it might be worthwhile to raise the Graves variety to type status.

Our new Baker variety comprises specimens of yet another long recognized but unnamed Avery subgroup referred to in the preliminary report on Cedar Grove (Schambach et al. 1982:137) as "the informal, eastern, Belcher phase, low rimmed variety of Avery Engraved established and illustrated by Webb (1959: Figures 120c and d)." This was not abundant at the Belcher site but it is abundant enough and distinctive enough in the Spirit Lake locality to warrant variety status. Since only semicircle motifs appear on vessels of this variety, its ties with Avery Engraved seem more secure than those of the Graves variety.

The Baker variety consists of designs of the Ernest pattern (semicircle motifs composed of ticked lines (Figure 11-9a) on the shoulders of bowls with short, straight, usually plain rims. The one whole vessel from the Cedar Grove cemetery (Figure 11-16a) that we might--but do not--assign to this variety does not quite fit because of its punctated rim and its exceptionally deep body, compared to all other known specimens of this group from the Spirit Lake locality.

Our new Bradshaw variety consists of high rimmed, shouldered bowls with typical Avery concentric half circle designs (of the Ernest, Ebano, and Eben patterns) on the shoulders and plain or ticked parallel horizontal lines (Bluefield or Benedict patterns) on the rims. The single identifiable specimen of this variety from the Cedar Grove

site, is a large rim-body sherd from Feature 17 (Figure 11-42a). It is matched by one whole vessel in the Lemley collection from the Lester site (Arkansas Archeological Survey negative number 695123) and two whole vessels in the C. B. Moore (M.A.I. 17/4122) and McClendon (Arkansas Archeological Survey negative number 714239) collections from the Battle site.

Belcher Engraved Bowls

These are the "flat bowls with sharp carinas" (Webb 1959:121; Figure 106a-b) of the original Belcher Mound report. We divide them into two varieties, mainly according to the presence or absence of small lugs or "quadrating nodes: (Webb 1959:122) on the vessel shoulder. These lugs or nodes are almost universally present (on 23 out of 25 specimens) in Webb's sample from the Belcher site. They are diagnostic of our Belcher variety.

Our Owen variety lacks the nodes of the Belcher variety. Belcher, var. Owen bowls also have less pronounced shoulders and deeper bodies. They generally have an incised line following the shoulder line on the interior. This line mimics the fold or crease found at the junction of rim and shoulder on bowls of the Belcher variety. It is an excellent sorting criterion for Owen, better than the absence of lugs, in fact, because it encircles the whole vessel.

The Owen variety was rare, if not absent, at the Belcher site. Both varieties are well represented in the Spirit Lake locality with Belcher (13 specimens) appearing mainly at the Battle and Handy sites. This strongly suggests that it is a significant Caddo IV marker. The Owen variety appears only at the Lester site and Cedar Grove. This seems to be the case at Cedar Grove itself where Belcher is restricted to Ceramic Group 1 burials and Owen replaces it in Ceramic Group 2 and 3 burials. We consider Owen a prime diagnostic of the Chakanina phase (Schambach et al. 1982).

The existing Caddo ceramic typology fails to differentiate between Belcher Engraved bowls and Belcher Engraved bottles. We think this is a mistake because the two forms do not overlap significantly in decoration. Furthermore, they seem to show some significant differences in temporal distribution. We will begin the process of splitting them typologically by assigning bowls and bottles to different varieties and by not recognizing a Belcher variety of bottles to match the Belcher variety in bowls.

Belcher Engraved Bottles

We recognize two varieties of Belcher Engraved bottles in the Great Bend Region. The "classic" or Soda Lake variety would be that described and illustrated by Webb at the Belcher site (1959:120-123; Figure 106, vessels j, k, o, p, and q). These are straight necked, globular bodied bottles with concentric circle designs featuring alternate rows of "interrupted dash or slotlike lines" surrounding a central disc. On this variety "four or more triangles" radiate from the central disc to produce a "sun symbol" (this is our Elizabeth 1 design).

While they are significantly absent from the Cedar Grove mortuary collection, classic Belcher var. Soda Lake bottles are abundant in the Spirit Lake and Boyd Hill localities (Table 11-2). Whole vessels from the following sites are represented in our photo files: Foster (seven specimens), Friday (one specimen), Cryer (one specimen), Battle (four specimens), Handy (one specimen), and Lester (seven specimens). On many of these the triangles in the central element tend to be tilted slightly, either clockwise or counterclockwise, trending towards a pinwheel effect.

In our new Ogden variety of Belcher Engraved this trend is completed. The triangle effect is completely lost and the pinwheel effect is pronounced. (This is our Elizabeth 2 design). Since only the Ogden variety appears in mortuary contexts at Cedar Grove, we believe that this seemingly minor difference in design deserves variety status. Elsewhere in the Spirit Lake locality it appears at Battle (two vessels) and at Lester (one vessel). We have not yet found it in collections from the Boyd Hill locality, where the Soda Lake variety is common (Table 11-2). The Ogden variety is probably a good marker for the final temporal subdivision of the Belcher phase in this part of the Great Bend region. The Soda Lake variety appears to be a good marker for some part of the earlier three quarters or so of the Belcher phase.

Belcher Ridged

Two varieties of Belcher Ridged (Webb 1959:136-139; Suhm and Jelks 1962:11) appear frequently on sites in the Spirit Lake and Boyd Hill localities (Table 11-2). One we will arbitrarily call the classic Belcher Ridged variety since both versions appear at the Belcher site and we have no inkling which might be earlier. It consists of an elongated vessel form that has a rolled lip, and vertical ridges on the entire body (our Hamilton 1 design) but lacks the contrasting rim design that usually occurs on Caddo vessels, particularly utility vessels. The other, our Wilson's Island variety, is similar to the Belcher Ridged variety in most respects. The critical difference is that it has a contrasting incised, brushed, or punctated rim design. The rim patterns recognized so far are Andes and Chico on whole vessels and Dewey on rim-body sherds in the sherd collection from Cedar Grove.

The relationship of Belcher Ridged (of either variety) to the mortuary complex is uncertain. Only one vessel actually appears, Vessel 1, in Burial 7, (Figure 11-19a) and its provenance is suspect because it is a recycled vessel fragment. At best, Belcher Ridged would be an uncertain Chakanina phase type. We suspect that it is absent from this phase and that the Burial 7 vessel fragment was picked out of an earlier trash deposit.

Cabaness Engraved

This is a new type, formed after consultation with C. H. Webb, and based on two vessels from Burial 9 (Figure 11-23a, b) and three from three other sites in the Lester Bend locality, namely Battle (Moore 1912: Figure 64), Lester (Arkansas Archeological Survey negative number 695148) and Cabaness (Arkansas Archeological Survey negative number 694632). It consists of wide mouthed, round bodied, fine ware bowls (both specimens from Burial 9 are shell tempered) with Eve or Ebony designs on the rims and Easy or Eaves designs on the bodies. The Eve and Ebony rim designs both employ the flattened oval motif (Figure 11-6) the only difference between them being the use of crosshatched as opposed to hatched backgrounds. The Easy and Eaves body designs feature simple circle, concentric circle or scroll motifs in panels (usually four) on crosshatched or hatched backgrounds (Figure 11-7).

This type is probably as rare outside the Great Bend region as it is within it. We know of only one possible occurrence beyond the Spirit Lake locality and this is only hinted at by a drawing of what seems to be a good Easy 1 body design from the Hatchell site in Bowie County, Texas (Suhm and Jelks 1962: Plate 1P).

Cabaness Engraved looks like a good Caddo V marker type. It might prove to be an exclusive diagnostic of the Chakanina phase, but we cannot be sure of this until we learn more about the occurrence of Easy 1 body designs at the Hatchell site.

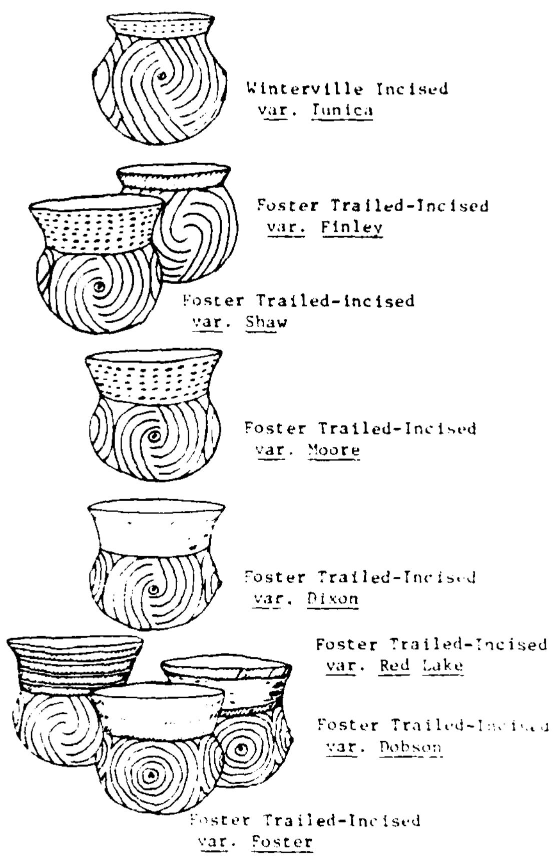


Figure 11-10. Evolution of Foster Trailed-Incised

Foster Trailed-Incised

One of the surprises in our analysis of the Cedar Grove mortuary pottery was the discovery of a great deal of what appears to be temporally significant variation in Foster Trailed-Incised. Contrary to our expectations, it may prove to be one best and most sensitive time indicators in the Great Bend region, and probably elsewhere in its broad panareal range throughout south Arkansas, and north Louisiana. Hence we have divided Foster Trailed-Incised (originally defined by Webb 1959:131-133, but not heretofore subdivided) into seven varieties based on differences in designs and decorative techniques. These are, in approximate chronological order: Foster, Dobson, Red Lake, Dixon, Moore, Finley, and Shaw (Figure 11-10). This does not exhaust the possibilities for new varieties within the type as a whole, or even within the type as it is known in the Great Bend region. In the latter case there are at least two presumably earlier ones, represented by vessels from the Foster site. (See Suhm and Jelks 1962; Plate 22G and Plate 22J and K).

The Foster variety, exemplified by one of C. B. Moore's vessels from the Foster site (Moore 1912:619, Figure 121, vessel 218; Suhm and Jelks 1962; Plate 22, B, see also Plate 22A and F), consists of high rimmed globular bodied, jars with concentric circle designs (our Baker pattern) on the bodies and multiple bands of zoned diagonal lines on the rims (our Alfred pattern). The concentric circle motif on the body is usually repeated three or four times and there are either single or multiple nipplelike nodes at the center of each set of circles. The diagonal line designs on the rim are composed of narrow incised lines while the concentric circle designs on the bodies are composed of broad trailed lines. (See Figure 11-21a and Figure 11-40.)

The Foster variety is well represented in our photo collection from the Spirit Lake and Boyd Hill localities (Table 11-2). There are six specimens from the Lester Place, two from Battle, two from Foster and one each from Friday, Russel, McClure, and Henry. Because of this extensive geographical distribution we think it is significant that the Foster variety appears only in our two Ceramic Group 1 burials at Cedar Grove (Table 11-12). Temporal significance seems to be indicated here and the occurrences at Foster, Friday, and McClure, which we consider late Caddo IV components, seem to support this hypothesis. The Foster variety looks like a good late Caddo IV marker.

The Dobson variety (Figure 11-32 and Figure 11-35b) has the same basic Foster vessel shape as the Foster variety and the bodies are decorated with the same trailed concentric circle patterns with center nodes (Baker pattern). The rim decorations, however, consist of either Arlis or Alaska patterns. The Arlis pattern consists of designs with a band of oblique zoned incised lines at the top and bottom of the rim and a broad band of horizontally placed straight or curvilinear incised lines in between. The Alaska pattern is the same except that the lines in the middle panel are brushed rather than incised. Additional vessels of this variety are represented in our photo collection. We have three from the Battle site and one from the Shaw site (3LA74), a small component in the Boyd Hill locality (Table 11-2).

The Red Lake variety (Figure 11-31b) shares the Foster vessel form and the zoned incised (Alfred) rim decorations with the Foster variety but the body design consists of a distinctive vertically oriented interlocking scroll or "volute" motif that we call the Babson pattern. The lines in the body design are trailed and there is generally a single flattened node at the center of each volute. Six vessels of this variety appear in our photo collection, two from Battle and four from the Lester site (Table 11-2). One of the four specimens from the Lester site is illustrated as a vessel of "uncertain provenience" in Suhm and Jelks 1962:Plate 22L).

The Dixon variety (Figure 11-25c and Figure 11-30b) shares the trailed-line Babson or "volute" body design with the Red Lake variety but the rim decoration changes from zoned diagonal incising to unzoned diagonal incising (our Agnes pattern). There also seems to be a tendency towards a widely flared or bell shaped rim. This is not exhibited by vessel 9 in Burial 9, (Figure 11-25c) but it is suggested by vessel 10 from Burial 10 (Figure 11-30b) and it is obvious in the two additional vessels of this variety that appear in our photo files, one from the Lester Place (Arkansas Archeological Survey negative number 695130) and one from Battle (Arkansas Archeological Survey negative number 693996).

The Moore variety is in all respects identical to the Dixon variety except that the rim decoration, which is superficially similar to Dixon rim designs, is, in fact, tool punctated--or stamped--(our Chattanooga pattern) rather than incised. We suspect that the substitution of punctation for incising on Foster Trailed-Incised rims has a good deal of temporal significance. It seems to be a very good Caddo V marker trait. Tool punctated rim sherds of this variety (and the Shaw variety) will probably turn out to be one of the best markers for Caddo V Chakanina phase assemblages when working with sherd collections.

The punctated rim of the Moore variety carries over into the Shaw variety, but Shaw body patterns are incised rather than trailed (Figure 11-28a). This, together with the punctated rims, could be considered grounds for a type distinction. While Shaw vessels continue to look like good Foster Trailed-Incised (compare Figure 11-28a with Figure 11-28c which are Shaw and Moore vessels from the same grave and probably made by the same potter) this particular

combination of a tool punctated rim with an incised volute design on the body leads directly to the eighteenth century type Emory Punctated (Story 1967:136-139) of the Caddo area (Harris et al. 1965; Jelks et al. 1967 and Gregory 1973:129 and Figure 13d-f, particularly f) and its obvious cognate in the Lower Mississippi Valley, the Tunica type Winterville Incised, var. Tunica (Brain 1979:234-237 and vessels P-70, P-11, P-25, P-50, and P-68). Shaw is, in fact, a transitional variety. It could be considered a late variety of Foster Trailed-Incised, where we leave it, or an early variety of Emory Punctated. Had Shaw been recognized a few years earlier, Emory Punctated might never have been recognized as a new type because its relationship to Foster Trailed-Incised would have been easier to see, and harder to ignore. Gregory's (1973:129) speculation that this type has a Red River origin seems to be correct, assuming that it is not represented among the 300-odd unstudied utility vessels recovered by C. B. Moore (1909) from the Keno and Glendora sites on the Lower Ouachita. If not, it probably developed (degenerated is perhaps a better term here) out of Foster Trailed-Incised in the Kadohadacho villages in the great Bend region around 1700-1730. Then it spread upriver to Norteno phase sites in Texas and downriver to the Adaes at Natchitoches, (Gregory 1973:129). From Natchitoches it went to the historic Tunica around Marksville, Louisiana, and from there to sites like Angola Farm and Trudeau where Brain (1979:234-237) classifies it as Winterville Incised var. Tunica, for reasons that we would not necessarily dispute.

We consider the Shaw variety a good Caddo V marker that probably dates to the first two decades of the eighteenth century. It was probably not exclusively a Chakanina phase variety.

The Finley variety is at the moment a variety based on one vessel (Figure 11-29a) and one rim-body sherd from Cedar Grove. However, we doubt that it is unique to this site and we expect to see other occurrences in Caddo V contexts. For the time being the description of our single whole vessel, Vessel 7, from Burial 10, will serve to define the variety. It has a single row of diagonally incised lines on a short rim (our Albertus 2 design) and a Babson 4, or trailed line volute design without center nodes on the body. The link between this variety and Foster Trailed-Incised is weak, due primarily to the vessel form. If Finley develops at all as a variety, we may also find grounds for assigning it to some other type.

Glassell Engraved

In the preliminary report on Cedar Grove we were pessimistic about our identification of Glassell Engraved from sherds and we hoped that further excavations would yield enough data to divide this poorly defined type into several cleaner types (Schambach et al. 1982). Glassell did not prove to be as abundant as we anticipated, so the best we have been able to do is establish two varieties. We continue to support Webb's suggestion (1959:141) that bottles should be removed from this type, since nothing like those included in the original description (Suhm and Jelks 1962:53 and Plate 27A, B, C, F, and I) has appeared at Cedar Grove.

Our Atkins variety, possibly weakly represented--but not positively identified--in the sherd collections from the middens and features and not represented at all in the mortuary ceramics, consists of bowls with Evan rim designs and plain bodies. The Evan pattern (Figure 11-6) employs a stylized interlocking scroll motif with curved lines--frequently pairs of curved lines-as background fillers, rather than hatching or cross-hatching. Contrary to our expectations, Atkins appears to be a Caddo IV variety, to judge from its limited distribution in the middens and its absence from the mortuary assemblage at Cedar Grove.

The Evan rim pattern is also used in our McGee variety (Figure 11-36 and Figure 11-37) but in this variety the bottom or body of the bowl is decorated as well. Several different designs were used, to judge from our photos of two whole vessels in the Lemley collection from Lester and Battle. Neither of these photos shows the bottoms very well, but they seem to resemble the Ecanda pattern found on vessel 5 from Burial 12 (Figure 11-37 and Figure 11-8) at Cedar Grove. This is an interlocking scroll design with double line background fillers, similar to the Evan rim pattern. The ticked line is present in the scroll motif, but not the hatching, cross hatching, and negative circle design elements that make up the background in patterns associated with later types like Hodges Engraved and Natchitoches Engraved.

McGee looks like a late Caddo IV variety. It may be present at the Belcher site (See vessels h and i in Webb 1959:78, Figure 67; 74, vessel 1 in Figure 62).

Hodges Engraved

Hodges Engraved, described and discussed by Webb (1959:123-128; see also Suhm and Jelks 1962:73-76) is a major Caddo IV period type of the Belcher phase in the Great Bend region and of the Mid-Ouachita phase in the Middle Ouachita region. As Webb (1959:126) points out, it lasted into the "Glendora focus," now known as the Caddo V period.

We divide the specimens of this type at Cedar Grove into bottles and bowls (these ought to be in separate types, but that is a battle we will not fight here). We further divide them into two bowl varieties, Armour and Sentell, and two bottle varieties, Candler and Kelly's Lake. The collection of 11 Hodges Engraved vessels from Cedar Grove seems to be completely representative of this type in the Spirit Lake locality where it is well represented by whole vessels in our photo files (Table 11-2). In other words, there are no varieties or possible varieties of Hodges Engraved from other sites in the Spirit Lake locality that are not represented at Cedar Grove. We have yet to find Hodges Engraved at a site in the Boyd Hill locality.

Our Armour variety of Hodges Engraved bowls consists of rim designs of the El Camino pattern on deep plain bodied bowls (Figure 11-15a, b, and d and Figure 11-34a). The El Camino pattern consists of designs based on an interlocking scroll and circle motif with a hatched as opposed to a crosshatched background. Our Sentell variety (Figure 11-13a and Figure 11-26b) is almost identical to the Armour variety, the only difference being the rim designs have a cross-hatched background, our Esther pattern. This is not much basis for a variety distinction and it is frankly experimental. We have noticed that the Armour variety is absent in our photo collection from both Lester and Battle and we wish to see what this means, if anything.

Hodges Engraved var. Candler (Figure 11-15c, Figure 11-23e, and Figure 11-27b) consists of spool necked bottles with body decorations that employ a negative ball-and-meander motif on a crosshatched or hatched background, our Early and Evelyn patterns. The difference between the Early and Evelyn patterns is that Early designs have a single ticked line running down the middle of the meander while Evelyn designs do not. The simpler Evelyn pattern may be the earlier of the two, to judge from the position of Burial 11 in our seriation chart (Table 11-12). We have put Burial 9 earlier than Burials 4 and 10 purely on the basis of this assumption. Variety Candler bottles are very common on sites in the Spirit Lake locality.

The difference between Candler and Kelly's Lake varieties is that Kelly's Lake has vertically placed truncated and folded negative meander-and-ball designs on a hatched or crosshatched background (Figure 11-23c), our Easter pattern. There does not seem to be much point in distinguishing between hatched and crosshatched backgrounds in this case because our single specimen, from Burial 9, has both types of background treatment in various places on the design.

Karnack Brushed-Incised

This type (Suhm and Jelks 1962:85 and Plate 43) was only tentatively identified from sherds in the preliminary report on Cedar Grove, but the appearance of whole vessels in Burials 1, 7, 11, 12, 14, and 15 confirmed our suspicion that it was present (Schambach et al. 1982:143). Karnack was a rare type at the Belcher site but it is fairly well represented at Cedar Grove and other sites in the Spirit Lake and Boyd Hill localities (Table 11-2). It is reported to be common to the west of us in east Texas (Suhm and Jelks 1962:85) where it probably has its heaviest distribution. This distribution, plus the distinctive vessel shapes and rim forms employed, suggests that it is a late western variant of the Caddo IV type Belcher Ridged.

We recognize two varieties of Karnack Brushed-Incised at Cedar Grove. The "classic" or Karnack variety has vertical brushing (Danbury pattern) applied to a short rimmed, globular bodied vessel with brushed, incised, or punctated rims, as in the type description (Figure 11-35a, Figure 11-38b, and Figure 11-41b). Our new Fish Bayou variety has broad line vertical trailing on the body (Figure 11-31a, our Abraham pattern) that is readily distinguished from the brushing or "brushed-incising" of classic Karnack. One Fish Bayou vessel appears in our photo collection from the Battle site (Arkansas Archeological Survey negative number 714215). Another appears at Belcher Mound (Suhm and Jelks 1962, Figure 43c; Webb 1959, Figure 121c).

This variety does not appear elsewhere in the Spirit Lake and Boyd Hill localities but it is well represented in our photo collection from sites along the northern arm of the "Great Bend" of the Red River from Fulton, Arkansas west into eastern Oklahoma and east Texas.

We first recorded it in the Pete Phillips collection (thus the variety name) from a site or sites--possibly the "2nd" Kadonadacho village of the Nicholas King map (Williams 1964, Figure 2)--along the north bank of the Red River about half way between Fulton, Arkansas, and the Oklahoma state line (two vessels, Arkansas Archeological Survey negative numbers 783800 and 783875). We have also recorded it in the Gene Redmond collection (one vessel, Arkansas Archeological Survey negative number 804227) from the Bowman site, where there is known to be a late component across Choctaw bayou from the Caddo I mound group. And it appears in the Ernest Sibert collection (three vessels, Arkansas Archeological Survey negative numbers 783256, 783268, and 783294) from the Anderson site in eastern Oklahoma.

We know of only one report of a vessel of this variety in the literature. This is a partial vessel from the Sam Kaufman site in Red River County, Texas (Skinner et al. 1969:Figure 16h and Figure 19f and d). Unfortunately it occurred in the fill of the "East mound," and its relationship to the Kaufman assemblage is unknown. Small quantities of trade goods of the period 1685 to 1740 are reported for the site (Skinner et al. 1969:26). Gregory Perino (personal communication, March 1981) has recently found three excellent specimens in good contexts in graves at the Williams site, (a component located roughly one half mile southeast of the Kaufman site, see Perino 1981:Figure 1), so we can expect to learn more about its ceramic ties soon. Perino states that an iron disc occurred in one of the graves containing a Keno Trailed var. Phillips bowl.

Keno Trailed var. Phillips is an important new variety, possibly one that our colleagues working to the west of us in eastern Oklahoma and east Texas will wish to raise to type status. Because of its tendency to appear on sites that seem to have just a few European trade goods, we consider it a marker for the first few decades of the Caddo V period, let us say 1700 to 1730.

Keno Trailed

Keno Trailed is considered one of the two prime diagnostics of the Caddo V period, the other being Natchitoches Engraved. It is also known to be an important late Caddo IV type (Webb 1945:64-67; Webb 1959:36; Suhm and Jelks 1962:87). It has been found in direct association with European artifacts at the Lawton site near Natchitoches, Louisiana, and at the Clements site in northwest Texas (Webb 1945:64). It has also been found in indirect, but probably valid, association with European artifacts at the Rosebrough lake site in the Great Bend region in east Texas (Miroir et al. 1973:119-120), at the Keno and Glendora sites in the Lower Ouachita Valley in Louisiana, and at the Douglas and Greer sites in the Lower Arkansas Valley in east central Arkansas (Webb 1945:67-68; Moore 1909, 1912).

This type is badly in need of subdivision since it seems likely that certain varieties will prove to be Caddo IV and pre-European while others will be Caddo V. We divide the five vessels in the Cedar Grove mortuary sample into four varieties: McClendon, Phillips, Glendora, and Scott's Lake. McClendon appears to be the earliest of this group and may prove to be late Caddo IV while Phillips, Glendora, and Scott's Lake appear to be contemporaneous and probably belong to the early part of the Caddo V period.

The McClendon variety (Figure 11-41a) consists of Belhaven 14 designs on spool necked, pedestal based bottles. The single Cedar Grove specimen is crudely executed, perhaps because it came from a six year old child's grave. The other three known vessels of this variety from the Spirit Lake locality, two from Lester and one from Battle, are equal to the finest Keno vessels found anywhere (Arkansas Archeological Survey negative numbers 714097, 695116, and 695201).

The Phillips variety consists of Blackburn designs on wide mouthed beakers (Figure 11-14a and Figure 11-17a). These usually have notched lips. (This is a good ancillary sorting criterion for rim sherds of this variety since lip notching is uncommon in Caddo pottery, particularly the fine wares.) The Blackburn pattern consists of vertically placed multiple line designs featuring somewhat rectilinear interlocking "hook" or scroll motifs repeated around the vessel (Figure 11-3). Something similar appears on certain vessels at the Glendora site (Moore 1909:66, Figure 60, vessel 166).

The Glendora variety consists of squat spool necked bottles with the complex Belhaven 13 and Belhaven 15 designs (Figure 11-18a, b). This variety is represented by one vessel from Burial 5 at Cedar Grove, one from the Lester site (Arkansas Archeological Survey negative number 695102)--with a Belhaven 13 design, and one from the Glendora site, also with a Belhaven 13 design (Moore 1909:45, Figure 23, vessel 172). This is, as we said earlier, probably a Caddo V Variety. But we have only circumstantial evidence to back this statement, namely the complexity of the decorations, the complex vessel shape and the occurrence of this variety at Glendora.

The Scott's Lake variety (Figure 11-26a) presents certain classificatory difficulties because the concentric circle motif of early varieties of Foster Trailed-Incised is apparently carried over into a fine ware (one of the few cases where this happens in Caddo ceramics) and indeed the vessel shape itself belongs more to the utility ware series than the fine ware series. Nevertheless these vessels are characteristic of Keno Trailed in both paste and line technique- the lines are sculpted in fine paste, Keno style, (our Bolton pattern) rather than trailed in coarse paste, Foster style. To call this pottery Foster Trailed-Incised rather than Keno Trailed would make these types mutually unsortable in sherd collections.

This variety seems to be particularly well represented at the Battle site. We have photos of four specimens from there, three in the Johnny McClendon collection, (Arkansas Archeological Survey negative numbers 714125, 714142, and 714143), one in the Lemley collection (Arkansas Archeological Survey negative number 994003) and there is one excellent specimen excavated by C. B. Moore (Moore 1912:571, Figure 61, vessel 10). There is a fifth specimen in the Pete Phillips collection from a site somewhere along the northern arm of the Great Bend of the Red River

between Fulton, Arkansas, and Texarkana (Arkansas Archeological Survey negative number 783810).

This variety should not be confused with a potential variety that is probably considerably earlier and comprised of very short necked ollalike bottles with concentric circles (Bolton pattern) or other curvilinear designs on the bodies and punctated compound necks. Specimens of this configuration are illustrated by Moore from the McClure site (1912:Figure 70, vessel 1) and the Foster site (1912:615, Figure 115, vessel 139) and by Webb from the Belcher site in Louisiana (1959:134, Figure 111a; there is a specimen identical to this one in the Lemley collection from the Lester site, Arkansas Archeological Survey negative number 695182.

Natchitoches Engraved

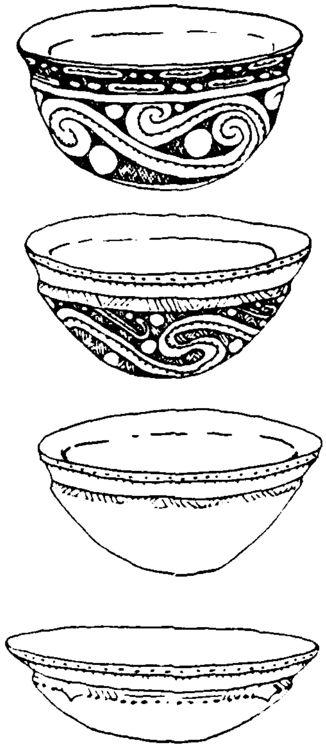
Natchitoches Engraved is considered the single best "full historic" or late Caddo V period marker type in the Caddoan ceramic assemblage. Unfortunately, there are many sorting difficulties with it. In fact, there are so many that we suspect that many identifications have been made more on the basis of association with European trade goods than on the attributes of the pottery itself. The main difficulty is in sorting Natchitoches Engraved from the stylistically similar type Hodges Engraved. We find this extremely difficult to do with whole vessels, and more so with sherds. Clearly these two "types" would be better handled as varieties of a single type (perhaps called Hodges-Natchitoches Engraved), but that is a problem we will not take up in this report. As was pointed out in the preliminary report on Cedar Grove (Schambach et al. 1982:141), the final (but dubious) distinction between Natchitoches Engraved and Hodges Engraved is that by definition, (Suhm and Jelks 1962:113) Natchitoches Engraved is shell tempered whereas Hodges Engraved is not. This makes Natchitoches Engraved an irregular type in Caddo ceramic typology because it is the only fine ware type where shell temper is used as the basis of a type distinction. The reason shell temper is generally not used for type distinctions in fine wares is that temper is usually not visible in them. As we noted earlier fine wares are fine wares because they have fine paste, which means the tempering particles are too small to see clearly, if at all. We are beginning to suspect that a distinction should be made within Natchitoches Engraved, not between shell or no shell, but simply between fine temper of any kind and coarse--really coarse--shell temper. It seems to us that the very latest vessels, those that turn up on full historic sites with abundant trade goods and that clearly date to the sunset years of the Caddo ceramic tradition, generally have very coarse, easily visible shell temper, (you can usually see the shell in the photographs of the whole pots). Usually they are also crude in form and design. This is crude pottery in all respects because the ceramic tradition was beginning to fall apart. We do not have any of this degenerate coarse shell tempered Natchitoches Engraved at Cedar Grove. We do have what seems to be an early or "developing" variety of Natchitoches, and we also have some fully developed but still technically and stylistically excellent Natchitoches, some of it with fine shell temper and some apparently without (Table 11-12).

We recognize two varieties of Natchitoches Engraved at Cedar Grove and other sites in the Spirit Lake locality: var. Lester Bend and var. Natchitoches. The Lester Bend variety, (Figure 11-17b, c and Figure 11-29b) which we see developing directly out of Belcher Engraved, consists of Central 1 or 2 rim designs combined with Eden or Easter body designs on bowl forms typical of Belcher Engraved var. Owen (Figure 11-11). This variety is well represented at Cedar Grove by two whole vessels from Burials 5 and 10 and by 22 sherds from the midden sample and from features (Table 11-12). The temper tends to be grog or something too fine to be visible, but occasional shell tempered sherds do occur. Temper is not a significant sorting criterion for this variety, as long as it is finely ground.

Whole vessels of Natchitoches Engraved var. Lester Bend are represented in our photo collection from three other sites in the Spirit Lake locality: Lester (three specimens), Battle (two specimens), and the Russel site (one specimen). One of the vessels from Battle is illustrated by C. B. Moore (1912:571; Figure 62, vessel 19). This variety also appears at the Glendora site, where Moore found at least two good examples of it (1909:55-56; Figure 39; vessel 307 and Figure 41, vessel 111; for Moore's vessel 111 see also Suhm and Jelks 1962; Plate 57K). All things considered, Lester Bend looks like an early Caddo V variety.

We reserve the Natchitoches variety for bowls (bottles, we think, should go into other varieties) of "classic" Natchitoches form and decoration as illustrated by Webb (1945:Plate 11, vessel 1) or Suhm and Jelks (1962:Plate 57D, F, G, I, and J). No whole vessels of this variety were found at Cedar Grove but it is represented in sherd form. Bowls of this variety are certainly not abundant in collections from the Spirit Lake locality, but there is one excellent var. Natchitoches bowl in the Richard Nix collection from a washed out grave located at or very near our Spirit Lake site 2 (Arkansas Archeological Survey negative numbers 812284 and 812285). It is shell tempered and it was apparently associated with a Natchitoches Engraved bottle of extremely good workmanship (Hemmings 1982:Figure 11f). We also have sherds from secondary gravel bar sites between Cedar Grove and Spirit Lake.

The single red slipped Natchitoches Engraved vessel from Burial 10 (Figure 11-27a) appears to belong to an important but as yet unidentified Natchitoches Engraved variety that centers in the Keno-Glendora locality of the Boeuf Basin in northeast Louisiana. The diagnostic attribute of this variety would be the use of a single design to cover both the rim and the body, contrary to the Caddo practice of putting different designs on the rim and body.



Natchitoches Engraved var. Natchitoches

Natchitoches Engraved var. Lester Bend

Belcher Engraved var. Owen

Belcher Engraved var. Belcher

Figure 11-11. Evolution of Natchitoches Engraved

DESCRIPTION OF THE MORTUARY POTTERY

GRAVE LOT 1

Provenience: Burial 1, an infant, 12-18 months old and Burial 2, human cranial fragments, probably from Burial 1, and remains of a bald eagle. The contents of Burials 1 and 2 were disturbed and mixed both by our site stripping and by the earlier historic levee building operations. This grave lot is probably incomplete; some associated vessels may have been scooped into the historic levee or destroyed during our site stripping operations.

All five vessels in this grave lot are miniatures. Three of them also vary appreciably from normal Caddo pottery in the areas of design, combinations of rim and body designs and vessel shapes.

Vessel 1

Illustrations: Figure 11-12
Type: Untyped bird effigy bowl, probably representing a quail
Variety: N/A
Rim treatment: plain, with head and tail adornos
Body treatment: plain
Temper: shell
Height: 37 mm
Outside oral diameter: 64 mm
Catalog number: 80-1209-596
Photo number: 815522
Comments: The interior and exterior are badly eroded. The attachment scar of a small adorno, probably representing a tail, appears on the rim directly opposite the head. A small hole, probably for a plume, passes through the head at about a 45 degree angle .

Vessel 2

Illustrations: Figure 11-13a
Type: Hodges Engraved bowl
Variety: Sentell
Rim treatment: engraved; Esther 1 design
Body treatment: plain
Temper: shell
Height: 58 mm
Outside oral diameter: 89 mm
Catalog number: 80-1209-608
Photo number: 815520
Comments: About half of this specimen was destroyed during site stripping or historic levee building operations. Fresh breaks indicate that it had been placed in the grave intact.

Vessel 3

Illustration: Figure 11-13b
Type: Karnack Brushed-Incised jar
Variety: unknown
Rim treatment: three rows of unzoned diagonal punctates (Chattanooga design)
Body treatment: vertically brushed (Danbury 1 design)
Temper: coarse shell
Height: 64 mm
Outside oral diameter: approximately 82 mm
Catalog number 80-1209-602
Photo number: 815519
Comments: About half of this specimen was displaced or destroyed by site stripping or levee building operations. Fresh breaks indicate that it had been placed in the grave intact. This particular combination of a punctated rim with a brushed body has yet to be recorded in "adult series" pottery of this type in southwest Arkansas.

Vessel 4

Illustration: Figure 11-13c
Type: unknown; small incised bowl
Variety: N/A
Rim treatment: uncertain--fine diagonal incising on the shoulder, rim badly crushed
Body treatment: plain
Temper: shell
Height: N/A
Outside oral diameter: N/A
Catalog number: 80-1209-604
Photo number: N/A
Comments: The specimen was crushed during site stripping operations. It is not reconstructable and the drawing in Figure 11-13c is based on very small sherds. The shape of the rim and the rim design are uncertain. We were unable to make any measurements, but the specimen is small--about the same size as the four other vessels with Burials 1 and 2. Neither this shape nor this design are known in the "adult series" pottery of southwest Arkansas.

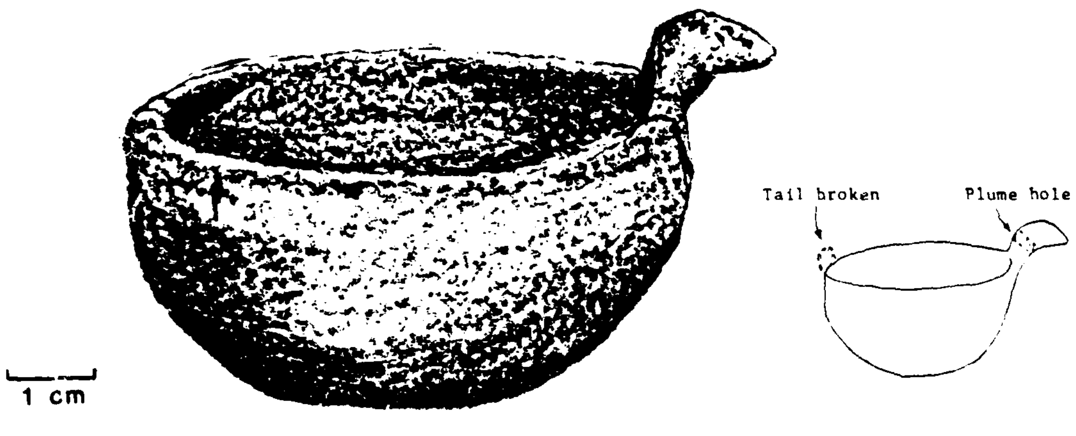


Figure 11-12. Pottery from Burials 1 and 2: bird effigy bowl

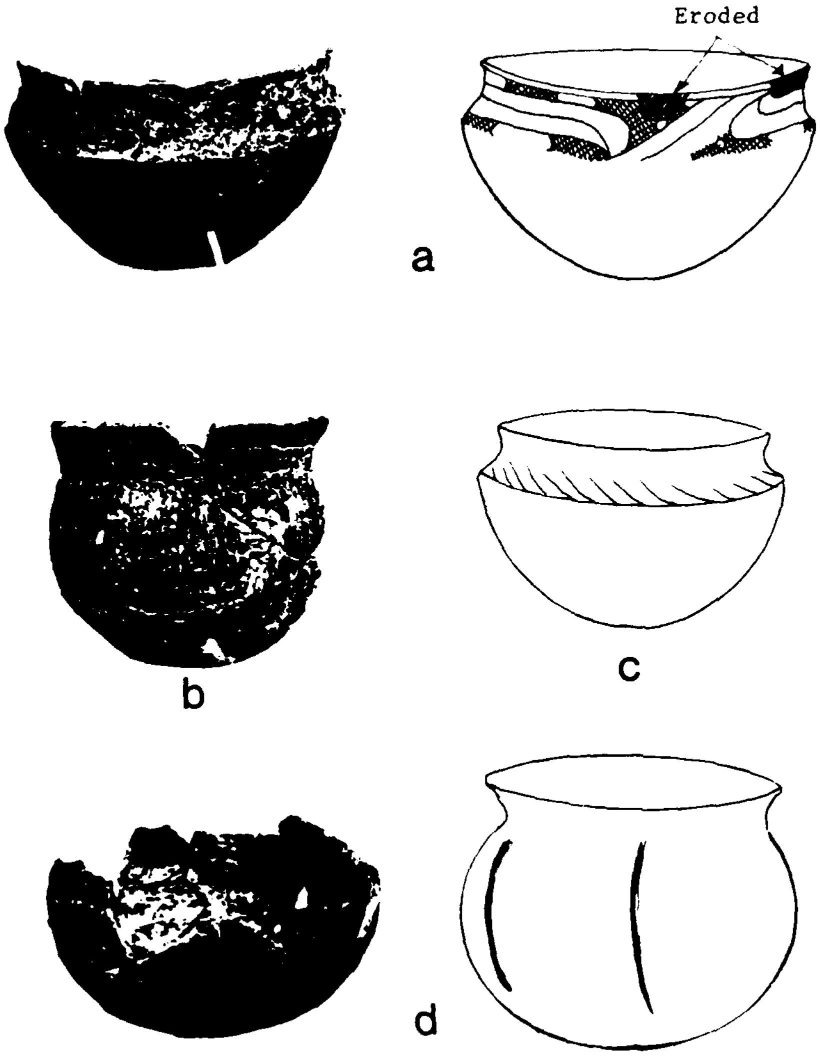


Figure 11-13. Pottery from Burials 1 and 2. a. Hodges engraved bowl, var. Sentell; b. Karnack Brushed-Incised jar; c. incised bowl, type unknown (vessel not restorable, drawing based on sherds); d. engraved jar, type unknown (upper portion not restorable, reconstruction based on sherds)

Vessel 5

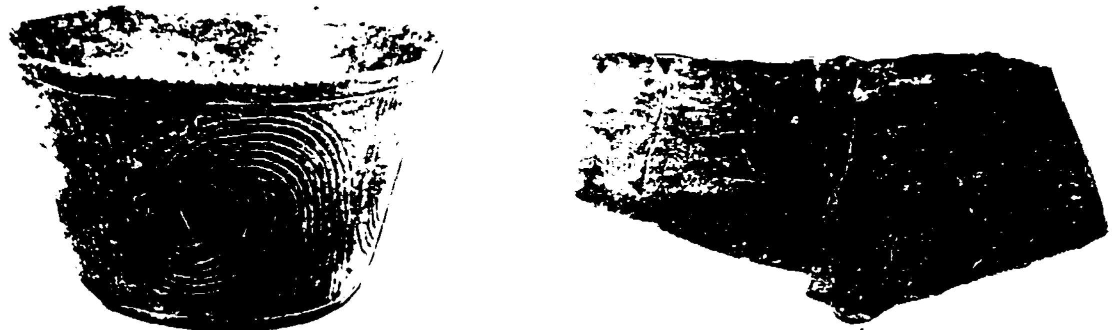
Illustrations: Figure 11-13d
Ware: fine
Type: unknown; small engraved jar
Variety: N/A
Rim treatment: plain
Body treatment: The body is decorated with four equally spaced, diagonally engraved lines
Temper: shell
Height: This vessel was between 50 and 60 mm when complete
Maximum body diameter: 81 mm
Catalog number: 80-1209-612
Photo number: 815523
Comments: This vessel was crushed during site stripping operations. The upper portion is not reconstructable but all elements of shape and design can be deduced from sherds. The simple engraved line design does not appear in "adult series" pottery in southwest Arkansas.

GRAVE LOT 2

Provenience: Burial 3, a female, 45-49 years old. This grave lot is incomplete. The entire midsection of the skeleton (from just above the feet to just below the chin) was cut away by Historic Burial 42. Additional vessels undoubtedly accompanied Burial 3 but were removed or destroyed when the historic grave was dug.

Vessel 1

Illustration: Figure 11-14a
Type: Keno Trailed-Incised beaker
Variety: Phillips
Rim treatment: The lip is notched



a b

Figure 11-14. Pottery from Burial 3. a. Keno Trailed beaker, var. Phillips; b. plain sherd, possibly from large bottle

Body treatment: fine trailed-incising, Blackburn [illegible] design. The design repeats four times.
Temper: shell
Height: [illegible] mm
Outside oral diameter: 141 mm
Catalog number: 30-1209-727
Photo number: [illegible]
Comments: There are two small chips missing from the [illegible], otherwise perfect. No good evidence of use or wear.

Vessel 2

Illustration: Figure 11-14b
Type: untyped; plain sherd, possibly from a large bottle
Variety: N/A
Temper: grog
Maximum length of sherd: 143 mm
Catalog number: 30-1209-804
Photo number: N/A
Comments: This could be the remains of either a large [illegible] bottle fragment or a whole bottle that was broken and mostly removed by Historic Burial 42. Judging from the placement of this sherd relative to Historic Burial 42, we think the former is more likely.

GRAVE LOT 3

Provenience: Burial 4, a female 20-24 years old. This burial was slightly disturbed by Historic Burials 39 and 40. One vessel (a Hodges Engraved bowl, Figure 11-15a) was cut in half by Historic Burial 40, but aside from that this grave lot appears to be complete. There is a slim possibility that some vessels near the feet of this burial were removed by Historic Burial 39.

Vessel 1

Illustration: Figure 11-15a
Type: Hodges Engraved bowl
Variety: Armour
Rim treatment: An El Camino [illegible] design with red pigment in the lines
Body treatment: plain
Temper: grog
Height: [illegible] mm
Outside oral diameter: 138 mm
Catalog number: 30-1209-[illegible]
Photo number: [illegible]
Comments: Half of this vessel was cut away by Historic Burial [illegible].

Vessel 2

Illustration: Figure [illegible]
Type: Hodges Engraved bowl
Variety: Armour
Rim treatment: [illegible] El Camino [illegible] design with red pigment in the lines
Body treatment: plain
Temper: grog
Height: 54 mm
Outside oral diameter: 95 mm
Catalog number: 30-1209-843
Photo number: 812943
Comments: No signs of wear. The missing rim pieces were probably carried away by gophers.

Vessel 3

Illustration: Figure 11-15c
Type: Hodges Engraved bottle
Variety: [illegible]
Rim and neck treatment: plain, neck slightly bulged, flaring rim
Body treatment: engraved, Early [illegible] design
Temper: grog
Height: 143 mm
Maximum diameter of body: 128 mm
Catalog number: 30-1209-824
Photo number: 812931
Comments: The lip is badly eroded in places, evidently due to postdepositional weathering. There are no signs of predepositional use or wear.

Vessel 4

Illustration: Figure 11-15d
Type: Hodges Engraved bowl
Variety: Armour
Rim treatment: El Camino 1 design with traces of red pigment in the lines
Body treatment: plain
Temper: grog
Height: 60 mm
Outside oral diameter: 120 mm
Catalog number: 30-1209-823
Photo number: 815533
Comments: This vessel is warped, with a large crack in one side. Interior and exterior surfaces are eroded.

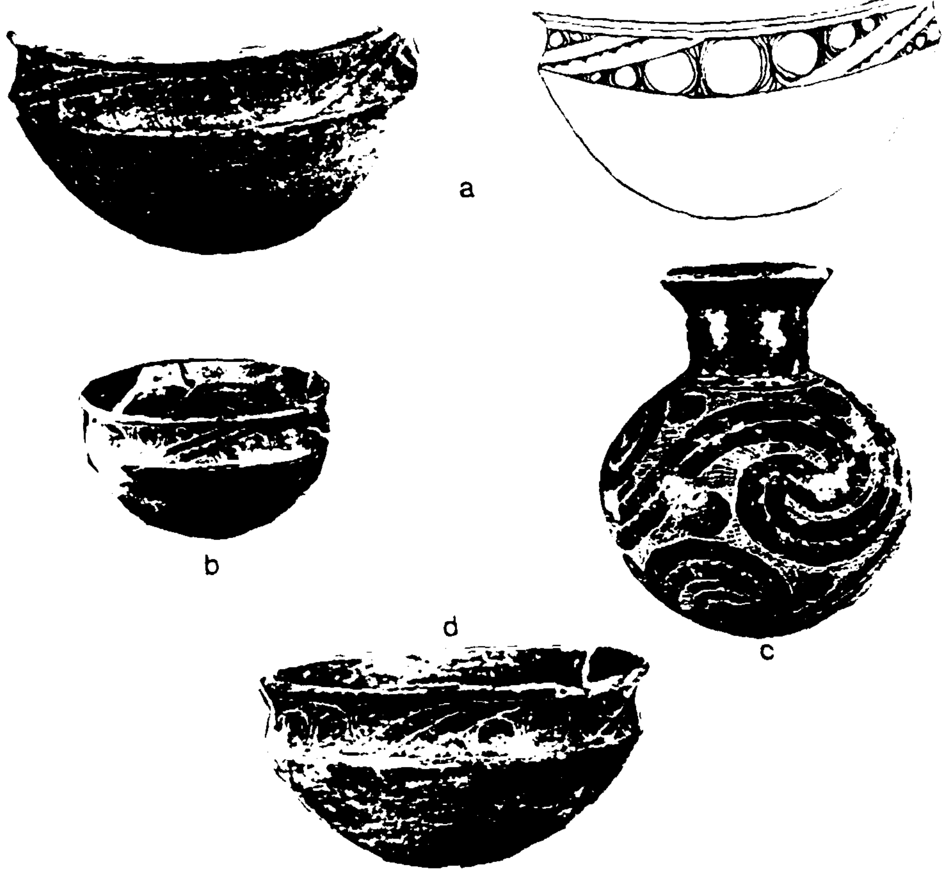


Figure 11-15. Pottery from Burial 4. a-b,d. Hodges Engraved bowls, *var. Armour*; c. Hodges Engraved bottle, *var. Candler*

Figure 11-16. Pottery from Burial 4. a. Avery Engraved bowl; b. Foster Trailed-Incised jar, *var. Shaw*

Vessel 5

Illustration: Figure 11-16a
Type: Avery Engraved bowl
Variety: unnamed
Rim treatment: single row of dry paste punctations or excisions
Body treatment: An Ernest 1 design applied via dry paste punctation and "engraving." The rising sun motif repeats four times. Traces of white pigment in the lines.
Temper: grog with occasional pieces of shell
Height: 165 mm
Outside oral diameter: 273 mm
Catalog number: 80-1209-710
Photo number: 815480
Comments: This vessel is slightly warped. Both the shape and the design suggest that it is an import from farther west along the Red River in east Texas or eastern Oklahoma.

Vessel 6

Illustration: Figure 11-16b
Type: Foster Trailed-Incised jar
Variety: Shaw
Rim treatment: unzoned punctation, Chattanooga 1 design
Body treatment: Boston 1, an incised--as opposed to trailed--design. The volute motif repeats four times.
Temper: coarse shell
Height: 130 mm
Outside oral diameter: 161 mm
Catalog number: 80-1209-708
Photo number: 815485
Comment: The rim damage is from our probing.

GRAVE LOT 4

Provenience: Burial 5, a male, 35-39 years old. This is probably an incomplete grave lot since the skull of Burial 5, plus any nearby offerings, was removed by Historic Burial 61.

Vessel 1

Illustration: Figure 11-17a
Type: Keno Trailed beaker
Variety: Phillips
Rim treatment: the lip is notched
Body treatment: a Blackburn 1 design. The interlocking multiple line motif repeats four times around the vessel. There are traces of red pigment in the design.
Temper: Primarily grog with an occasional piece of shell
Height: 90 mm
Outside oral diameter: 145 mm
Catalog number: 80-1209-714
Photo number: 812933
Comments: The bottom of this specimen has been eroded away, probably as a result of postdepositional processes.

Vessel 2

Illustrations: Figure 11-17b, c, and d
Type: Natchitoches Engraved bowl
Variety: Lester Bend
Rim treatment: A punctated and incised Central 2 design on the exterior. A single incised line on the interior at the shoulder line.
Body treatment: An Eden 1 (vertically placed volutes and circles on a hatched background) design. The volute and circle motif is repeated four times.
Temper: shell
Height: 72 mm
Outside oral diameter: 193 mm
Catalog number: 80-1209-713
Photo number: 815498, 815499
Comments: No evidence of wear or use

Vessel 3

Illustrations: Figure 11-18a and b
Type: Keno Trailed bottle
Variety: Glendora
Rim and neck treatment: A short, bulging "spool neck" with a single incised line half way down.
Body treatment: An intricate interlocking scroll design (Belhaven 13) that inverts itself as it repeats (twice) around the vessel body. Two horizontally incised lines on the modified pedestal base.
Temper: This vessel has no cracks or nicks so temper cannot be determined with certainty but it looks and feels like grog. There is abundant mica showing on the surface.
Height: 120 mm
Maximum body diameter: 121 mm
Catalog number: 80-1209-711
Photo numbers: 815525 and 815526
Comment: No evidence of wear and use. Vessel #172 from the Glendora site (Moore 1909:45, Fig. 23) is virtually identical to this vessel. Considering the complexity of the Belhaven 13 designs, this is no coincidence.

Vessel 4

Illustration: Figure 11-18c
Type: Belcher Engraved bowl
Variety: Owen
Rim treatment: A Central 1 design with white pigment in the lines. One horizontally incised line on the inside of the bowl at the shoulder line.
Body treatment: plain
Temper: There are no nicks or cracks on this specimen so the temper is difficult to determine, but it looks and feels like grog. There is a considerable amount of mica in the paste.
Height: 67 mm
Outside oral diameter: 143 mm
Catalog number: 80-1209-712
Photo number: 815509
Comment: There are no signs of use or wear.

Vessel 5

Illustration: Figure 11-18d
Type: Foster Trailed-Incised jar
Variety: Not determinable since the rim is missing but the possibilities are limited to Moore, Red Lake, or Dixon because of the Babson 3 body design.
Rim: missing
Body treatment: Babson 3, a trailed volute design with single flattened center nodes
Temper: coarse shell
Height of specimen; rim missing: 145 mm
Maximum body diameter: 164 mm
Catalog number: 80-1209-715
Photo number: 815501
Comment: This is a "recycled" vessel. The rim was broken off and the edges were lightly ground or worn down, indicating use as a rimless jar before it was buried.

GRAVE LOT 5

Provenience: Burial 7, a 20-24 year old male. Burial 7 was undisturbed. This is a complete grave lot. It is unusual in that it consists entirely of recycled vessels. There is no possibility that these vessels were damaged by plowing or levee building since this grave was 70 cm deeper than the surface on which the historic levee was built.

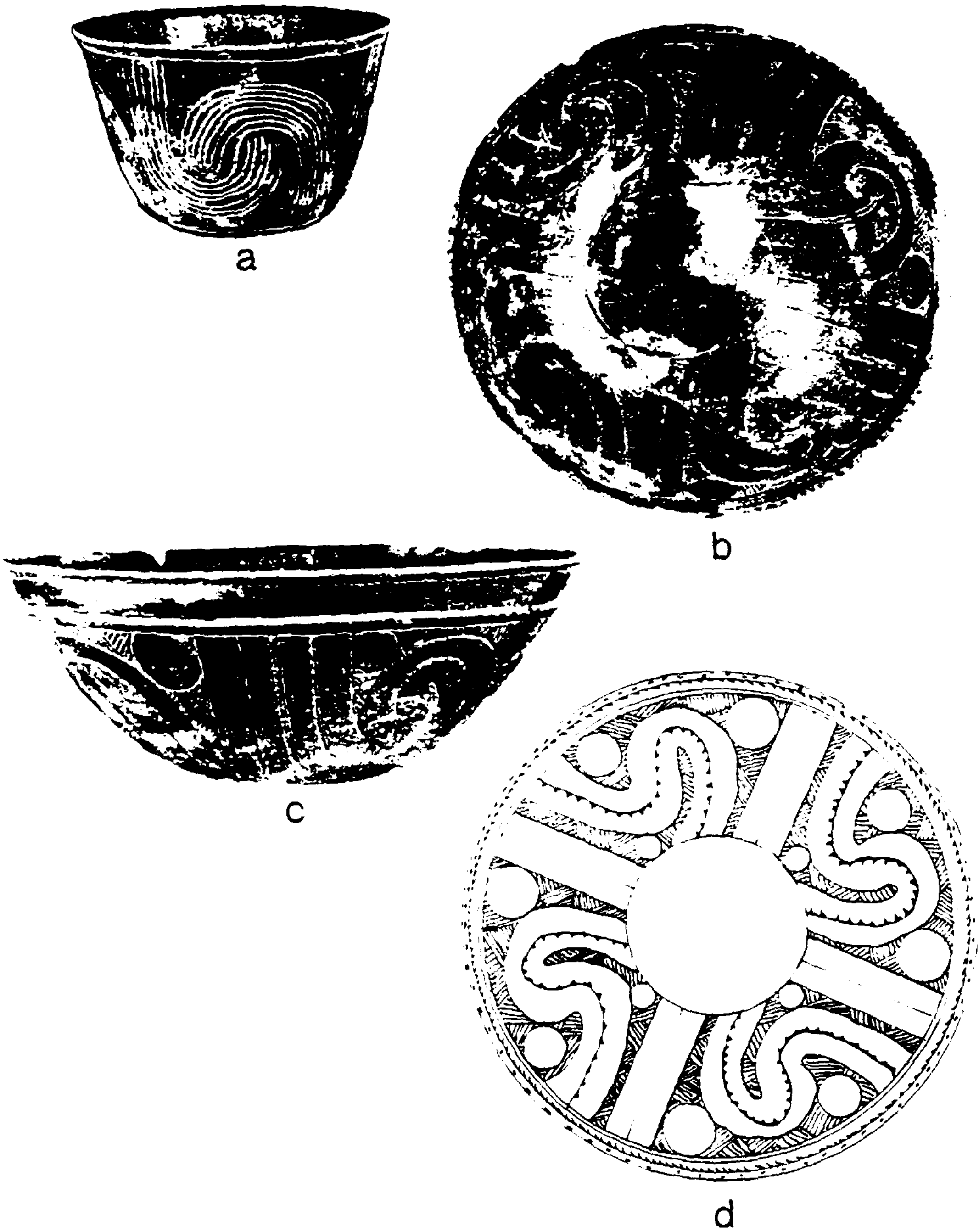


Figure 11-17. Pottery from Burial 5. a. Keno Trailed beaker, var. Phillips; b-d. two views and a drawing of Natchitoches Engraved, var. Lester Bend

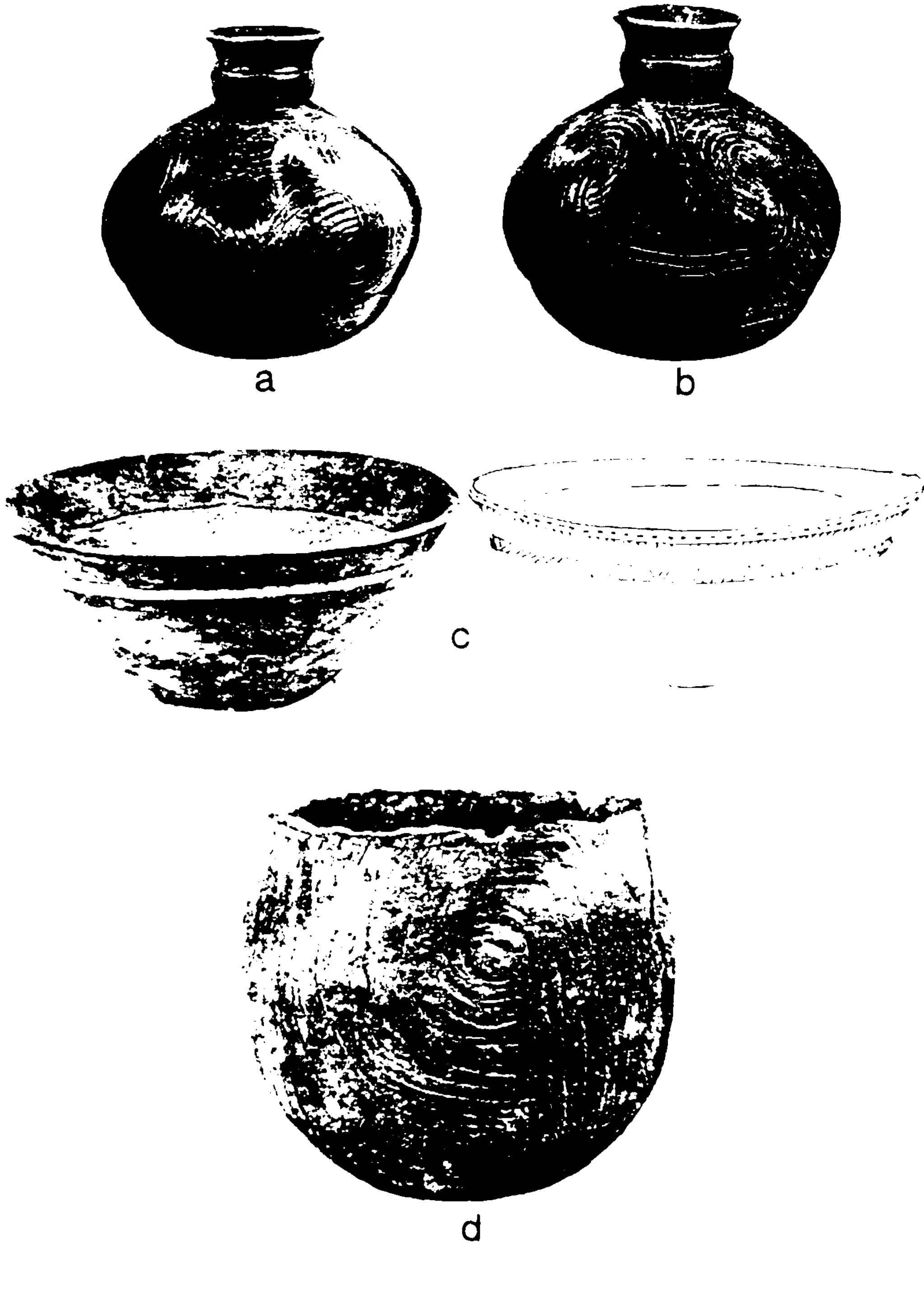


Figure 11-18. Pottery from Burial 5. a. Keno Trailed bottle, var. Glendora; b. same vessel, different view; c. Belcher Engraved bowl, var. Owen; d. Foster Trailed incised jar (rim is missing)

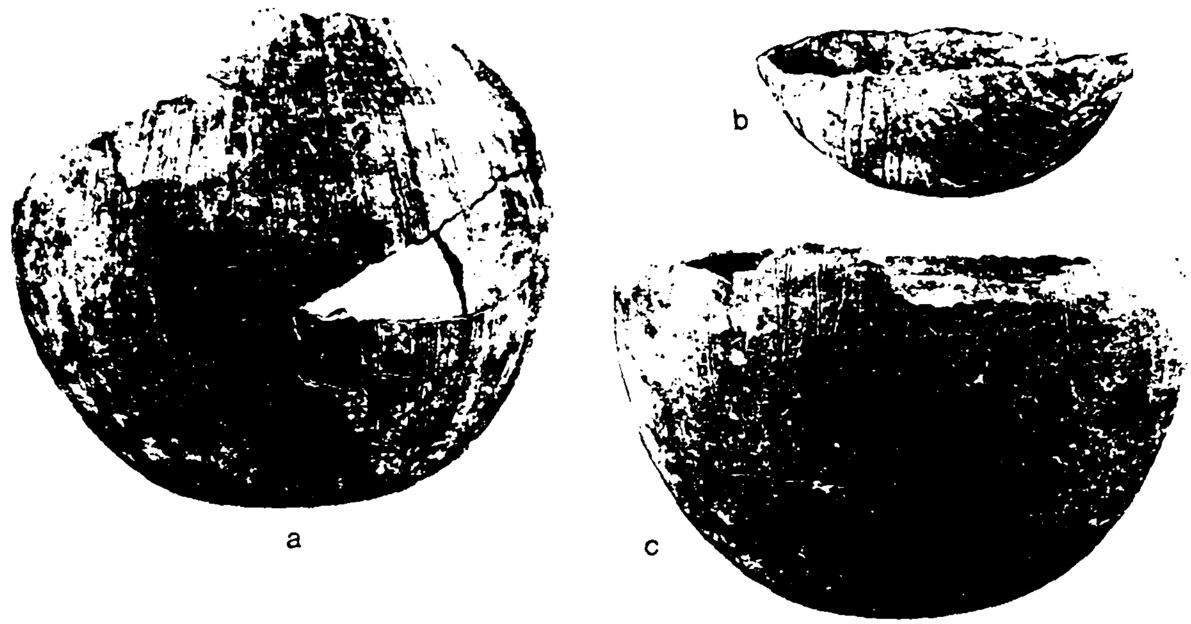


Figure 11-19. Pottery from Burial 7. a large fragment of body of Belcher Ridged jar; b. base of Foster Trailed-Incised jar; c. base of Karnack Brushed-Incised jar

Vessel 1

Illustration: Figure 11-19a
Type: incomplete Belcher Ridged jar
Variety: not determinable
Rim: missing
Body treatment: [illegible] vertical ridging. There are traces of [illegible] and of [illegible] pigment or possibly [illegible] on the exterior.
Temper: shell
Height: [illegible]
Maximum body diameter: [illegible]
Catalog number: [illegible]
Photo number: [illegible]
Comments: The rim and one side of this specimen were broken before burial. It was placed in the grave on its side as if it had been recycled for use as a bowl.

Vessel 2

Illustration: Figure 11-19b
Type: Foster Trailed-Incised jar
Variety: not determinable
Rim: missing
Body treatment: Broad trailed incised lines covering all but the base of the specimen. The design is not reconstructable but it appears to be a rectilinear pattern, which is unfamiliar to us, rather than one of the curvilinear patterns common in the Cedar Grove series. Also, it appears to repeat itself only three times on the vessel, rather than the usual four times.
Temper: shell
Height: [illegible]
Outside basal diameter: [illegible]
Catalog number: 80-[illegible]
Photo number: 81296?
Comments: This specimen was broken prior to burial and had apparently been recycled for use as a shallow bowl.

Vessel 3

Illustration: Figure 11-19c
Type: Karnack Brushed-Incised jar
Variety: not determinable
Rim: missing
Body treatment: [illegible] Vertically incised lines covering the vessel body
Temper: coarse shell
Height: 154 mm
Maximum body diameter: 22[illegible] mm
Catalog number: 80-1209-972
Photo number: 81548?
Comments: This specimen had been broken before it was put in the grave. The edges are lightly ground or worn, good evidence of recycling.

Vessel 4

Illustration: Figure 11-20a
Type: a fragment of a very large plain bottle
Variety: N/A
Rim: missing
Body treatment: plain, exterior well smoothed; the interior has the unsmoothed surface characteristic of bottle interiors
Temper: primarily grog with occasional pieces of shell
Maximum length of specimen: 340 mm
Catalog number: 80-1209-97?
Photo number: 81552?
Comments: Evidently recycled for use as a platter.

Vessel 5

Illustration: Figure 11-20[illegible]
Type: Belcher Engraved bowl
Variety: Owen
Rim treatment: A Central [illegible] design on the exterior: a

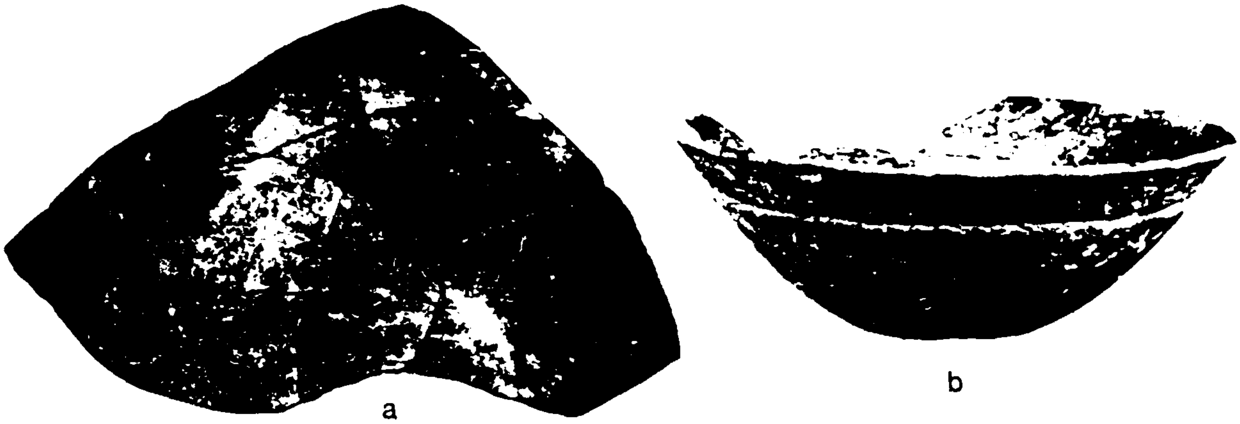


Figure 11-20. **Pottery from Burial 7. a. fragment of large plain bottle; b. Belcher Engraved bowl, var. Owen**

[illegible] horizontal incised line on the interior at the shoulder. Traces of white pigment [illegible] exterior [illegible].
Body treatment: plain
Temper: [illegible]
Height: [illegible] mm
Outside oral diameter: [illegible] mm
Catalog number: 30-1209-[illegible]
Photo number: [illegible]
Comments: The rim damage on this vessel [illegible] somewhat worn and was probably sustained prior to burial. We think this is a recycled specimen. The [illegible] hole in the side of the bowl is [illegible].

GRAVE LOT 6

[illegible] Burial 8, a 35-39 year old [illegible] Burial 8 [illegible] grave lot.

[illegible]

Illustration: Figure [illegible]
Type: Foster Trailed-Incised var. [illegible]
Variety: Foster
Rim treatment: [illegible] three bands of unzoned diagonal incised lines.
Body treatment: Baker 4: trailed concentric circles with [illegible] central nodes, repeated four times.
Temper: coarse shell
Height: [illegible] mm
Outside oral diameter: 160 mm
Catalog number: 30-1209-766
Photo number: 315481
Comments: There is a very light coating of soot on the upper body of this specimen while the base shows slight thermal reddening. Placing a pot directly in a small cooking fire would produce this kind of sooting and reddening.

Vessel 2

Illustration: Figure 11-21b
Type: Belcher Engraved bottle
Variety: Ogden
Rim and neck treatment: plain, tapered neck, flared rim
Body treatment: An Elizabeth 2 design with traces of red pigment in the lines
Temper: [illegible], but this looks and feels like a [illegible] tempered vessel.

Height: 201 mm
Maximum body diameter: 1[illegible]0 mm
Catalog number: 30-1209-764
Photo number: 3[illegible]29[illegible]
Comment: This is evidently a used vessel. Several small chips are missing from the lip, suggesting wear sustained during a period of normal use for a bottle of this kind. One side of the body has black fire clouding while the other shows thermal reddening. This could come from being placed in the edge of a cooking fire.

Vessel 3

Illustrations: Figure 11-21c
Type: Belcher Engraved bowl
Variety: Belcher
Rim treatment: A Central 5 design on a sharp shouldered bowl with four pronounced nodes. The slanted line motif is repeated four times.
Body treatment: plain
Temper: grog with large pieces of shell scattered throughout
Height: 35 mm
Outside oral diameter: 215 mm
Catalog number: 30-1209-765
Photo number: 315513
Comments: This bowl is slightly warped. The lip was damaged slightly during excavation.

Vessel 4

Illustration: Figure 11-21d
Type: Belcher Engraved bottle
Variety: Ogden
Rim and neck treatment: plain, neck straight, flaring rim
Body treatment: An Elizabeth 2 design with red pigment in the lines
Temper: grog, some mica showing
Height: 132 mm
Maximum body diameter: 102 mm
Catalog number: 30-1209-767
Photo number: 312[illegible]
Comments: The lip is chipped slightly in several places, suggesting that this bottle saw some use prior to being buried.

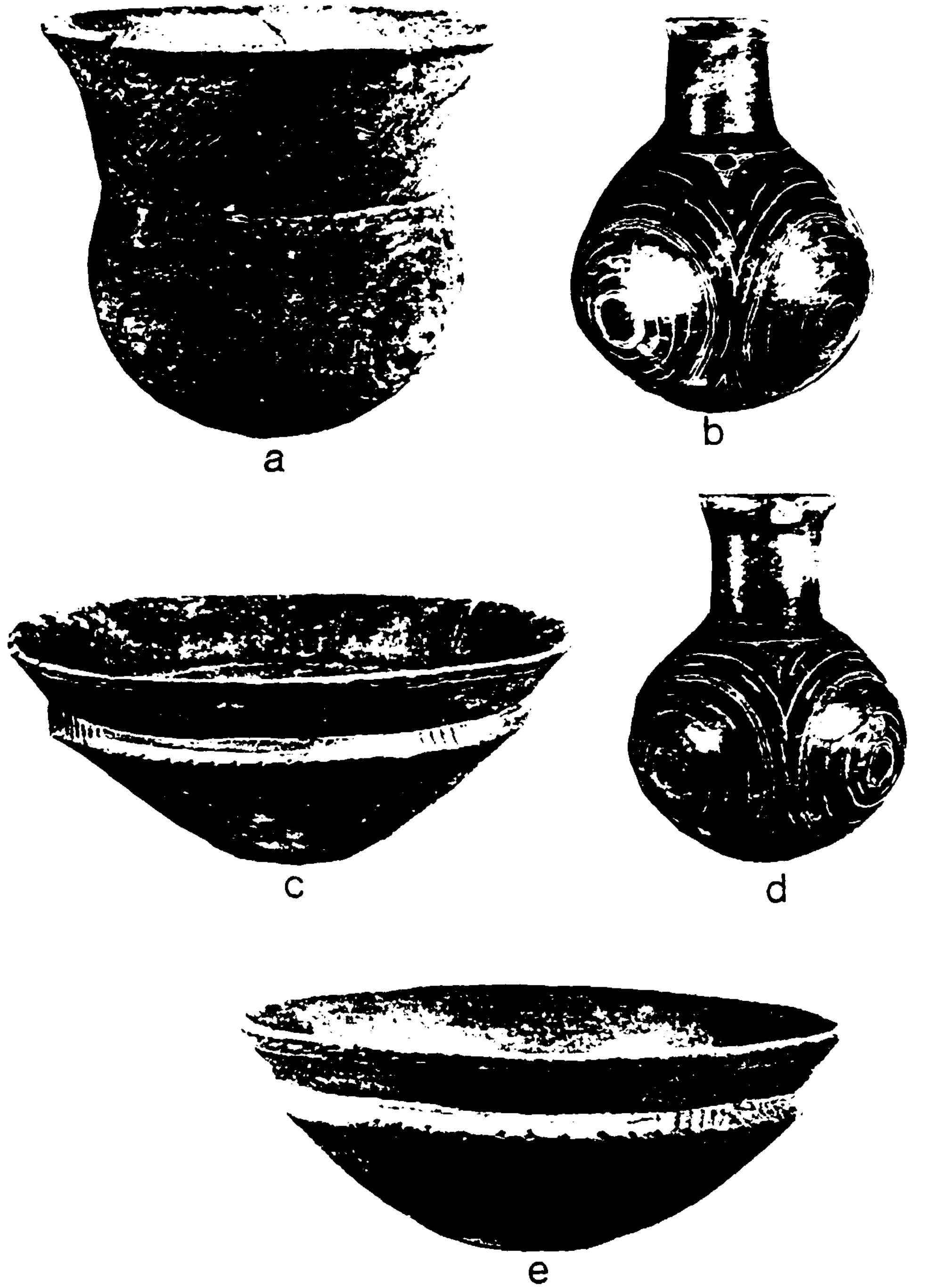


Figure 11-21. Pottery from Burial 8. a. Foster Trailed-Incised jar, var. Foster; b. Belcher Engraved bottle, var. Ogden; c. Belcher Engraved bowl, var. Belcher; d. Belcher Engraved bottle, var. Ogden; e. Belcher Engraved bowl, var. Belcher

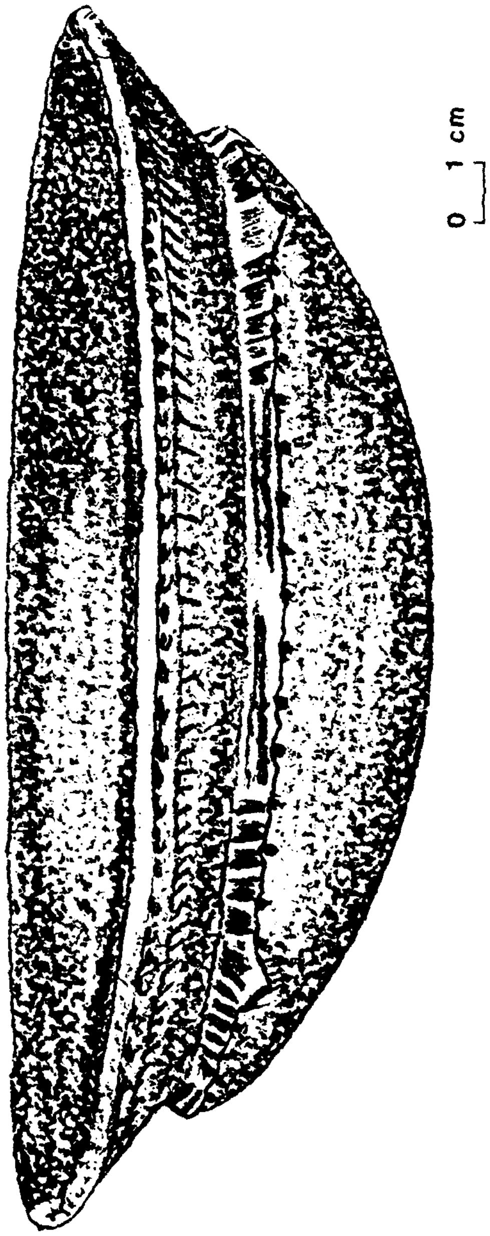


Figure 11-22. Pottery from Burial 8. Belcher Engraved bowl, var. Belcher;

Vessel 5

Illustration: Figure 11-21e
Type: Belcher Engraved bowl
Variety: Belcher
Rim treatment: A Central 11 design on a sharp shouldered bowl with four nodes. The design repeats four times.
Body treatment: plain
Temper: not visible, probably grog
Height: 70 mm
Outside oral diameter: 187 mm
Catalog number; 80-1209-763
Photo number: 815508
Comments: no indications of use or wear

Vessel 6

Illustrations: Figure 11-22
Type: Belcher Engraved bowl
Variety: Belcher
Rim treatment: A Central 7 design on a very sharp shouldered bowl with four nodes. The design repeats four times.
Body treatment: plain
Temper: grog, mica in the paste
Height: 50 mm
Outside oral diameter: 169 mm
Catalog number: 80-1209-893
Photo number: 815512
Comments: no signs of use or wear

GRAVE LOT 7

Provenience: Burial 9, a male, more than 50 years old. Burial 9 was undisturbed. This is a complete grave lot.

Vessel 1

Illustration: Figure 11-23a
Type: Cabaness Engraved bowl
Variety: N/A
Rim treatment: An Ebony 1 design with white pigment in the lines.
Body treatment: An Eaves 1 design with white pigment in the lines. The circle-with-interlocking-scroll motif repeats four times.
Temper: shell
Height: 69 mm
Outside oral diameter: 135 mm
Catalog number: 80-1209-1172
Photo number: 815503
Comments: No obvious signs of use or wear.

Vessel 2

Illustration: Figure 11-23b
Type: Cabaness Engraved bowl
Variety: N/A
Rim treatment: An Eve 1 design with traces of white pigment in the lines
Body treatment: An Eaves 1 design with traces of white

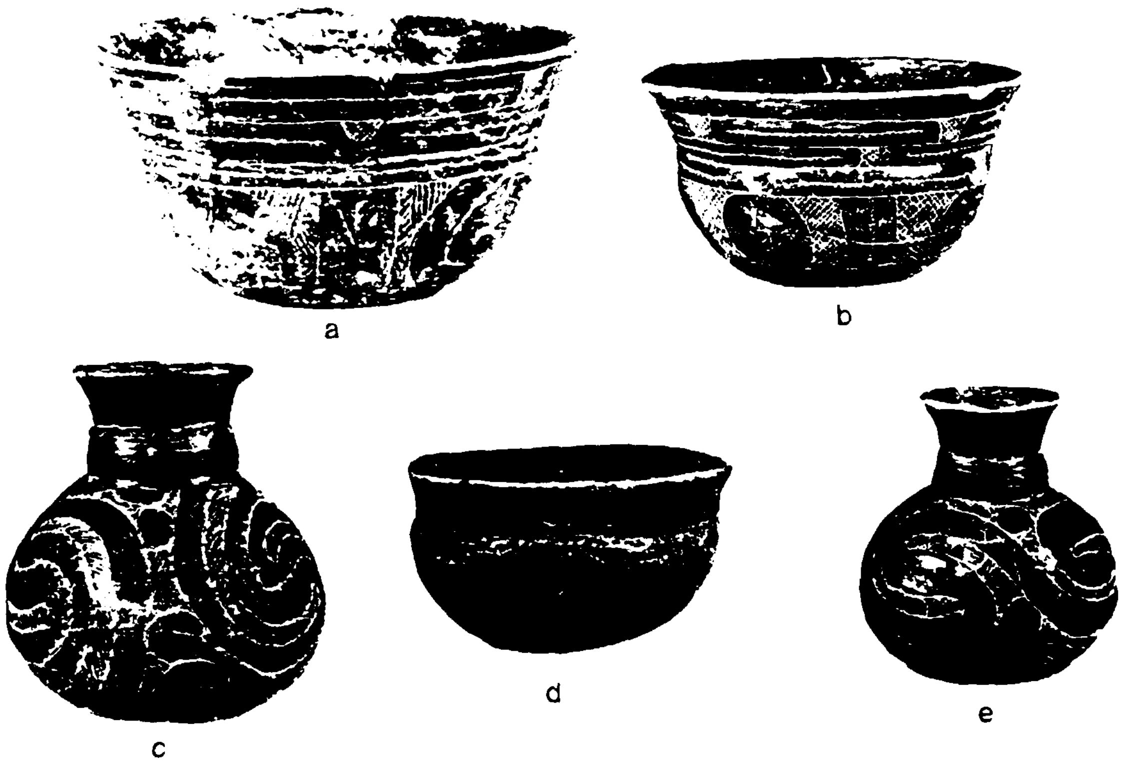


Figure 11-23. Pottery from Burial 9. a-b. Cabaness Engraved bowl; c. Hodges Engraved bottle, var. Kelly's Lake; d. engraved bowl, type unknown, possibly Patton Engraved; e. Hodges Engraved bottle, var. Candler

pigment in the lines. The circle motif is repeated four times.
Temper: very fine shell
Height: 72 mm
Outside oral diameter: 141 mm
Catalog number: 80-1209-1180
Photo number: 812968
Comments: No obvious signs of use or wear

Vessel 3

Illustration: Figure 11-23c
Type: Hodges Engraved bottle
Variety: Kelly's Lake
Rim and neck treatment: A plain "spool neck"
Body treatment: An Easter 1 design with traces of red pigment in the lines. The vertical folded meander motif repeats three times.
Temper: None visible since the specimen is not cracked or chipped
Height: 88 mm
Maximum body diameter: 84 mm
Catalog number: 80-1209-1174
Photo number: 815531
Comments: No signs of use or wear.

Vessel 4

Illustration: Figure 11-23d
Type: Unknown; small engraved bowl, possibly Patton Engraved
Variety: N/A
Rim treatment: an irregular lightly engraved pair of parallel ticked lines
Body treatment: plain
Temper: shell
Height: 49 mm
Outside oral diameter: 85 mm
Catalog number: 80-1209-1181
Photo number: 815531

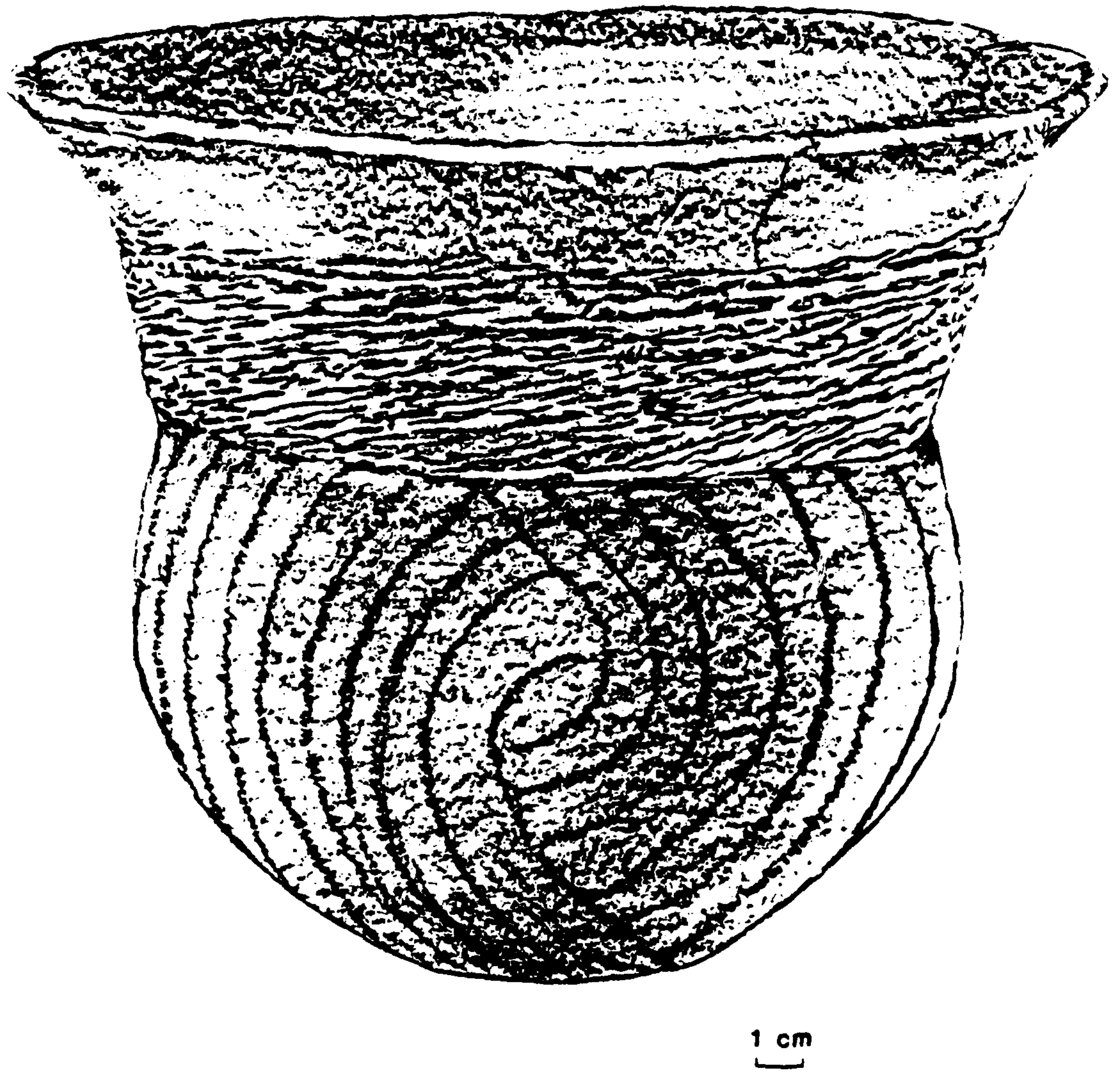


Figure 11-24. Pottery from Burial 9. a. Foster Trailed-Incised jar, var. Moore

Comments: Portions of the exterior of the rim and upper body are encrusted with a white substance, apparently calcium carbonate.

Vessel 5

Illustration: Figure 11-23e
Type: Hodges Engraved bottle
Variety: Candler
Rim and neck treatment: A "spool neck," with a flared rim
Body treatment: An Evelyn 1 design with heavy red pigment in the lines.
Temper: This bottle has no nicks or cracks so temper cannot be checked on a fresh break. It looks and feels as though it is grog-tempered.
Height: 92 mm
Maximum body diameter: 89 mm
Catalog number: 80-1209-1175
Photo number: 815529
Comments: No signs of use or wear.

Vessel 6

Illustration: Figure 11-24
Type: Foster Trailed-Incised jar
Variety: Moore
Rim treatment: Chattanooga 3, a band of unzoned,

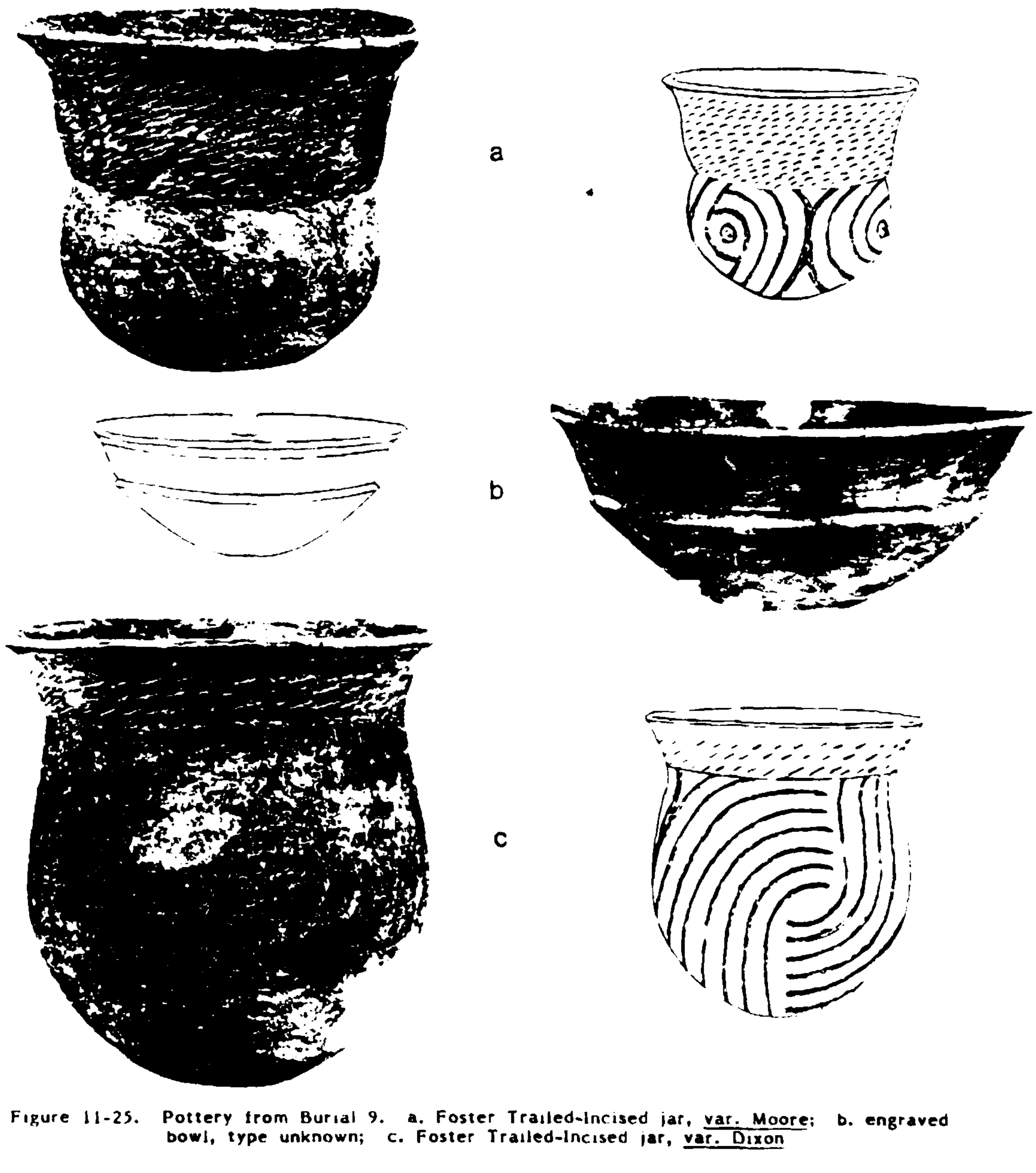


Figure 11-25. Pottery from Burial 9. a. Foster Trailed-Incised jar, var. Moore; b. engraved bowl, type unknown; c. Foster Trailed-Incised jar, var. Dixon

diagonally placed tool punctations
Body treatment: Babson 4, a trailed-line volute design with no center nodes. The volute motif repeats three times.
Temper: coarse shell
Height: 194 mm
Outside oral diameter: 233 mm
Catalog number: 80-1209-1176
Photo number: 815175
Comments: The interior and portions of the exterior are lightly coated with soot.

<u>Vessel 7</u>

Illustration: Figure 11-25a
Type: Foster Trailed-Incised jar
Variety: <u>Moore</u>
Rim treatment: Chattanooga 1, unzoned diagonally placed tool punctations covering most of the rim.
Body treatment: Babson 3, a lightly trailed volute design with flattened center nodes. The volute motif repeats four times.
Temper: coarse shell
Height: 105 mm
Outside oral diameter: 123 mm
Catalog number: 80-1209-1183
Photo number: 815504
Comments: No obvious signs of use or wear

<u>Vessel 8</u>

Illustration: Figure 11-25b
Type: Engraved bowl of unknown type.
Variety: N/A
Rim treatment: One engraved line runs around the rim just below the lip.
Body treatment: plain, traces of red pigment on the body
Temper: grog with occasional particles of shell
Height: 60 mm
Outside oral diameter: 153 mm
Catalog number: 80-1209-1184
Photo number: 815507
Comments: The form is that of Belcher Engraved, <u>var. Owen</u> bowls. This might represent a new single line variety of Belcher Engraved but since we do not have other examples in our reference collection, we think it is more probably an idiosyncratic specimen.

<u>Vessel 9</u>

Illustration: Figure 11-25c
Type: Foster Trailed-Incised jar
Variety: <u>Dixon</u>
Rim treatment: Agnes 2, three rows of unzoned short diagonal incisions on lower two-thirds of rim.
Body treatment: Babson 4, a trailed line volute design without central nodes. The volute motif repeats four times.
Temper: coarse shell
Height: 178 mm
Outside oral diameter: 173 mm
Catalog number: 80-1209-1179
Photo number: 815499
Comments: This pot has a very heavy coating of soot all over the interior and on the upper three-fourths of the exterior.

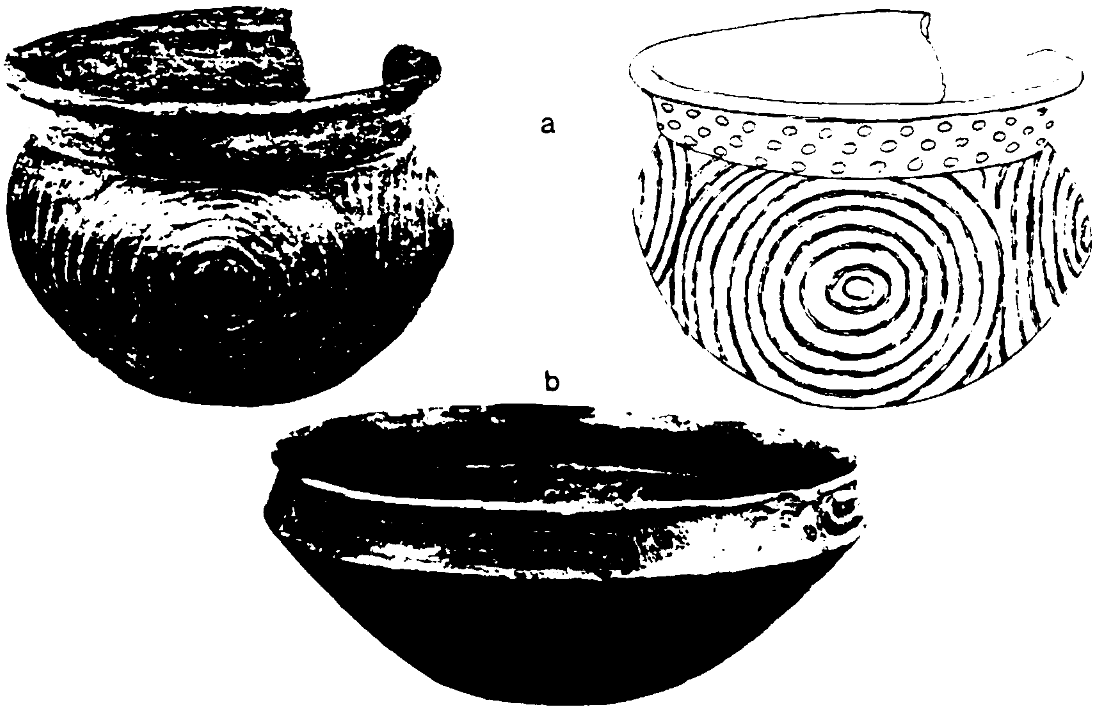


Figure 11-26. Pottery from Burial 9. a. Keno Trailed jar, <u>var. Scott's Lake</u>; b. Hodges Engraved bowl, <u>var. Sentell</u>

<u>Vessel 10</u>

Illustration: Figure 11-26a
Type: Keno Trailed jar
Variety: <u>Scott's Lake</u>
Rim treatment: Culver 3, three rows of ring punctations
Body treatment: A Bolton 1 design, the concentric circle motif is repeated four times.
Temper: grog with occasional particles of shell
Height: 95 mm
Outside oral diameter: 125 mm
Catalog number: 80-1209-1182
Photo number: 815514
Comments: This pot is badly warped.

<u>Vessel 11</u>

Illustration: Figure 11-26b
Type: *Hodges Engraved* bowl
Variety: <u>Sentell</u>
Rim treatment: An Esther 1 design repeated two times
Body treatment: plain
Temper: grog with occasional particles of shell
Height: 88 mm
Outside oral diameter: 202 mm
Catalog number: 80-1209-1177
Photo number: 815492
Comments: No signs of use or wear on this specimen.

GRAVE LOT [illegible]

<u>Provenience</u>: Burial 10, a 12 to 15 year old juvenile (sex undetermined). Burial 10 was undisturbed. This is a complete grave lot.

<u>Vessel 1</u>

Illustration: Figure 11-27a
Type: Natchitoches Engraved jar
Variety: unknown
Rim and body treatment: A single Easter 2 design covers both the rim and body. (This contrasts with the usual Caddo practice of putting different designs on the rim and body of a pot and it will be ample basis for variety status, if not new type status, when more vessels of this description are recorded.) The "scroll and hook" motif is repeated four times. Red slip was applied, both inside and out, <u>after</u> the design was applied. Two clusters of four evenly spaced suspension holes were drilled opposite each other on the rim.
Temper: grog with occasional particles of shell
Height: 85 mm
Outside oral diameter: 105 mm
Catalog number: 80-1209-1133
Photo number: 815505
Comment: This pot differs substantially from the run of the mill fine ware at this site in being very thin (3 mm) and in having a distinctive flaky yellow paste. We suspect that this is the same "yellow ware" described by C. B. Moore for many Natchitoches Engraved vessels from the Glendora site, some of which are also red

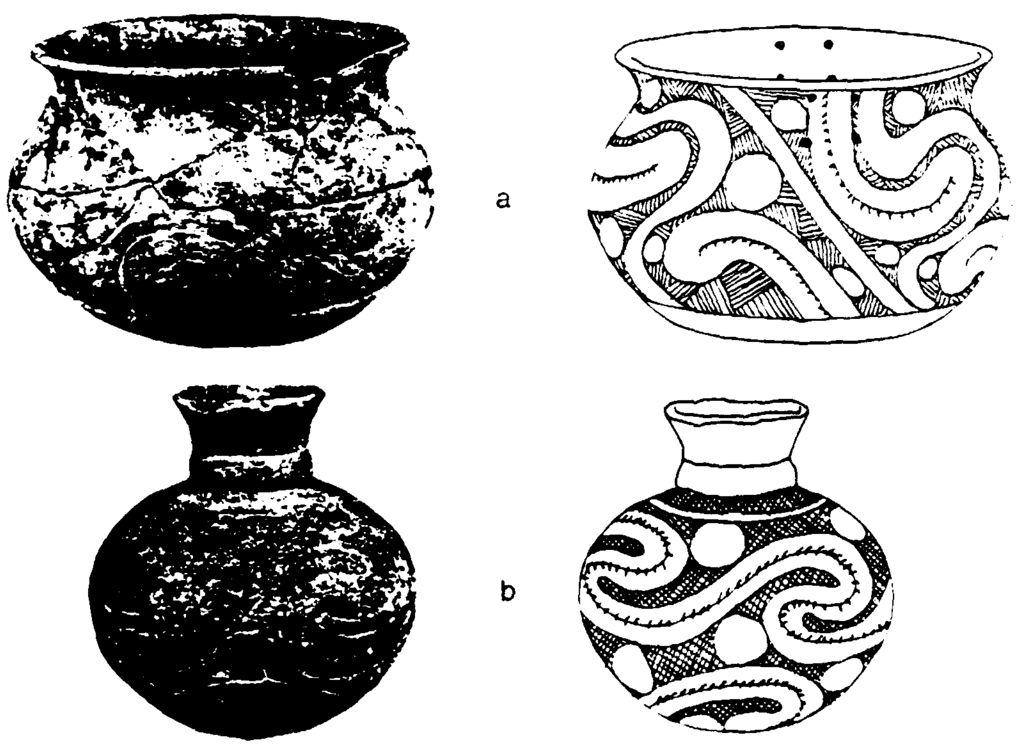


Figure 11-27. Pottery from Burial 10. a. red-slipped Natchitoches Engraved jar; b. Hodges Engraved bottle, <u>var. Candler</u>

slipped and have opposing clusters of (drilled) quadruple suspension holes (Moore 1909:31-73, Plate I, vessel 132, Plate I, vessel 130 and possibly vessel number 22, Plate IV). All things considered, this pot looks like a true import from the Keno-Glendora locality in the Boeuf Basin (or region) (see Belmont 1951:Figure 1).

<u>Vessel 2</u>

Illustration: Figure 11-27b
Type: Hodges Engraved Bottle
Variety: <u>Candler</u>
Rim and neck treatment: Plain flaring rim, short "spool neck."
Body treatment: An Early 1 design with traces of red pigment in the lines. The meander motif is repeated four times.
Temper: not visible
Height: 101 mm
Maximum body diameter: 101 mm

Catalog number: 80-1209-1124
Photo number: 815517
Comments: This vessel is slightly warped. The rim was damaged slightly during excavation. No obvious signs of use or wear.

<u>Vessel 3</u>

Illustration: Figure 11-28a
Type: Foster Trailed-Incised jar
Variety: <u>Shaw</u>
Rim treatment: Chattanooga 1, i.e., unzoned punctation
Body treatment: A Boston 1, or incised--not trailed--volute design with single flattened center nodes. The volute motif is repeated four times.
Temper: coarse shell
Height: 144 mm
Outside oral diameter: 165 mm
Catalog number: 80-1209-1135
Photo number: 815484
Comments: no signs of use or wear

Figure 11-28. Pottery from Burial 10: a. Foster Trailed-Incised jar, <u>var. Shaw</u>; b. Belcher Engraved bowl, <u>var. Owen</u>; c. Foster Trailed-Incised jar, <u>var. Moore</u>; d. base fragment of large plain bottle

Vessel 4

Illustration: Figure 11-28b
Type: Belcher Engraved bowl
Variety: Owen
Rim treatment: A Central 1 design. The slanted line motif is repeated four times. There is one horizontally incised line on the interior of this bowl, at the shoulder line.
Body treatment: plain
Temper: cannot be determined since this specimen has no cracks or breaks and no temper particles are visible on the surface. Probably grog or mostly grog.
Height: 53 mm
Outside oral diameter: 138 mm
Catalog number: 80-1209-1122
Photo number: 815511
Comment: No signs of use or wear

Vessel 5

Illustration: Figure 11-28c
Type: Foster Trailed-Incised jar
Variety: Moore
Rim treatment: Chattanooga 1, i.e., unzoned punctations
Body treatment: Babson 3, a volute design composed of broad trailed lines. This design has flattened single nodes at the center of each volute. The volute motif is repeated four times.
Temper: coarse shell
Height: 205 mm
Outside oral diameter: 228 mm
Catalog number: 80-1209-1134
Photo number: 815477
Comments: no signs of use or wear

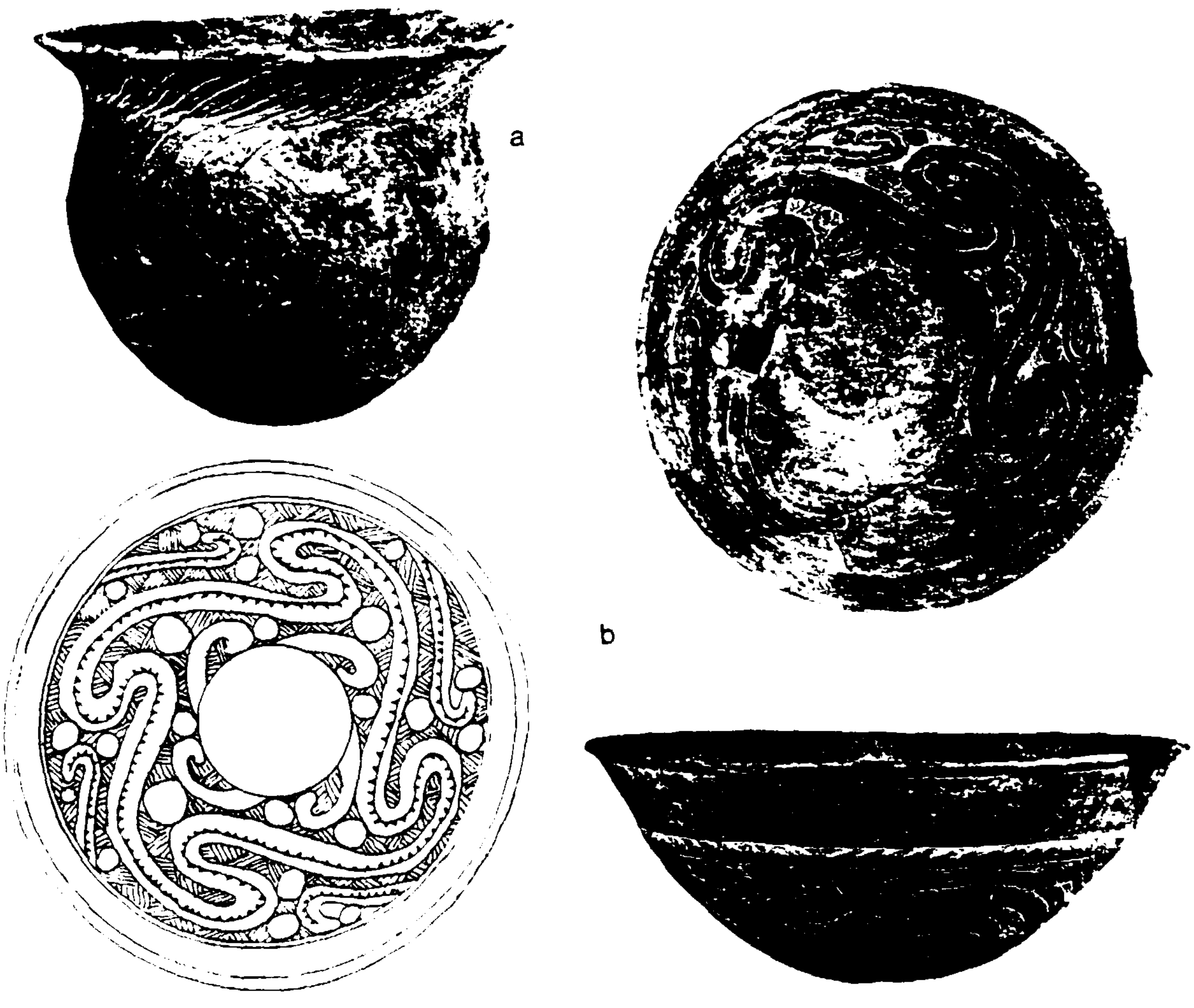


Figure 11-29. Pottery from Burial 10. a. Foster Trailed-Incised jar, var. Finley; b. Natchitoches Engraved bowl, var. Lester Bend

<u>Vessel 6</u>

Illustration: Figure 11-28d
Type: Untyped; base of large bottle
Rim and neck treatment: missing
Body treatment: Plain; the exterior is well smoothed to polished, the interior has the rough surface characteristic of bottle interiors.
Temper: grog
Original height: Unknown. Height of illustrated specimen is 138 mm
Maximum body diameter: approximately 240 mm
Catalog number: 30-1209-1129
Photo number: 812944
Comments: This specimen was broken prior to placement in the grave. It had been placed on its side which suggests that it is a recycled specimen that was being used as a bowl.

<u>Vessel 7</u>

Illustration: Figure 11-29a
Type: Foster Trailed-Incised jar
Variety: <u>Finley</u>
Rim treatment: Albertus 2, a single row of diagonally incised lines on a short rim
Body treatment: Babson 4, a trailed line volute design without center nodes. The volute motif is repeated four times.
Temper: grog
Height: 125 mm
Outside oral diameter: 1[illegible]8 mm
Catalog number: 30-1209-1126
Photo number: 315482
Comments: no obvious signs of use or wear

<u>Vessel 8</u>

Illustrations: Figure 11-29b
Type: Natchitoches Engraved bowl
Variety: <u>Easter Bend</u>
Rim treatment: a Central [illegible] design with a horizontally incised line on the <u>interior</u> at the shoulder. Traces of white pigment in the lines of the exterior design.
Body treatment: Easter [illegible] design with traces of white pigment in the lines
Temper: fine grog with occasional pieces of shell
Height: 85 mm
Outside oral diameter: 220 mm
Catalog number: 30-1209-1132
Photo number: 315495 and 315497
Comments: No signs of use or wear.

<u>Vessel 9</u>

Illustration: Figure 11-30a
Type: Belcher Engraved bowl
Variety: <u>Owen</u>
Rim treatment: Central 4, with a horizontally incised line on the interior at the shoulder
Body treatment: plain
Temper: grog
Height: [illegible]0 mm
Outside oral diameter: 138 mm
Catalog number: 30-1209-11[illegible]5
Photo number: 315506
Comments: No signs of use or wear.

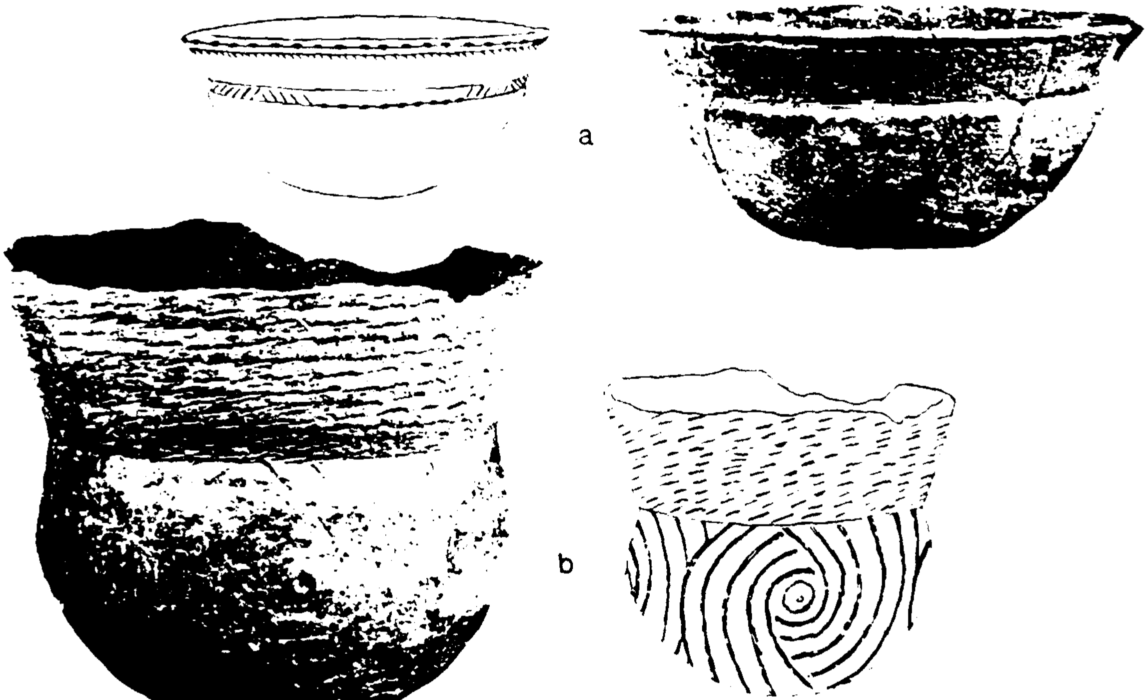


Figure 11-30. Pottery from Burial 10. a. Belcher Engraved bowl, <u>var. Owen</u>; b. Foster Trailed-Incised jar, <u>var. Dixon</u>

Vessel 10

Illustration: Figure 11-30b
Type: Foster Trailed-Incised jar
Variety: Dixon
Rim treatment: Alfred 6, unzoned incised lines in rows
Body treatment: Babson 3, a trailed line volute design with flattened center nodes. The volute motif is repeated four times.
Temper: coarse shell
Height: 153 mm
Maximum body diameter: 151 mm
Catalog number; 80-1209-1137
Photo number: 815483
Comments: This is a "recycled" vessel. The upper part of the rim was broken off prior to burial and the vessel evidently saw some use in that condition before being placed in the grave.

GRAVE LOT 9

Provenience: Burial 11, a 45 year old female. This is an incomplete grave lot. The lower half of Burial 11 was cut away by Historic Burial 9. The remaining vessels were crushed by earthmoving equipment during our site stripping operations.

Vessel 1

Illustration: Figure 11-31a
Type: Karnack Brushed-Incised jar
Variety: Fish Bayou
Rim treatment: Austin 1; irregular vertical incising on a short rim
Body treatment: Abraham 1; broad line vertical trailing
Temper: shell
Height: 132 mm
Outside oral diameter: 160 mm
Catalog number: 80-1209-697
Photo number: 815387
Comments: No signs of use or wear

Figure 11-31. Pottery from Burial 11. a. Karnack Brushed-Incised jar, var. Fish Bayou; b. Foster Trailed-Incised jar, var. Red Lake; c. Keno Trailed bottle (b and c were not restorable; reconstructions were based on sherds)

Vessel 2

Illustration: Figure 11-31b
Type: Foster Trailed-Incised jar
Variety: Red Lake
Rim treatment: Altered 4 bands of diagonal incising
Body treatment: Babson or a trailed line volute design with small triangular panels of punctations at the shoulder line.
Temper: shell
Height: approximately 90-100 mm
Outside oral diameter: approximately 100-110 mm
Catalog number: 80-1209-698
Photo number: N/A
Comments: This specimen was complete but too badly crushed to restore. The drawing and the size estimates are based on sherds.

Vessel 3

Illustration: Figure 11-31c
Type: Keno Trailed bottle
Variety: Undetermined
Rim and neck treatment: a plain "spool neck"
Body treatment: A not quite identifiable design of the "trailed" line Belhaven pattern. It consists mainly of interlocking scrolls. This motif is repeated four times.
Temper: shell
Height: estimated from sherds, between 120-150 mm
Maximum body diameter: between 110 and 130 mm
Catalog number: 80-1209-695
Photo number: N/A
Comments: This specimen is too badly crushed for complete restoration.

Vessel 4

Illustration: Figure 11-32
Type: Foster Trailed-Incised jar
Variety: Dobson
Rim treatment: An Alaska 1 pattern, i.e., horizontal brushing between two rows of diagonal incising.
Body treatment: Baker 3, a trailed concentric circle design with single center nodes. The circle motif is repeated four times.
Temper: coarse shell
Height: indeterminable
Maximum body diameter: between 200-300 mm
Catalog number: 80-1209-699
Photo number: N/A
Comments: We found several large pieces of this jar in the backdirt left by the grave diggers who removed Historic Burial 9 for relocation on November 17, 1980. We found matching fragments of this jar in Aboriginal Burial 11 which was bisected during the removal of the historic grave. This jar is not complete. The drawing and measurements are based on sherds.

Vessel 5

Illustration: Figure 11-33
Type: Hodges Engraved bottle
Variety: Candler
Rim and neck treatment: a plain "spool neck"
Body treatment: Evelyn 1, a double meander design on a crosshatched background. There are traces of red pigment in the lines.
Temper: very fine shell
Height: (as is) 132 mm
Maximum body diameter: 166 mm
Catalog number: 80-1209-696
Photo number: N/A
Comments: This bottle was too badly crushed for a complete restoration. This is unfortunate because from an artistic point of view--considering vessel form, color, design layout and execution—this is the finest specimen in the Cedar Grove collection and one of the finest we have seen from the Great Bend region. This is worth noting because Burial 11 was a female; it suggests that women were not being slighted in the type or quality of vessels used as grave offerings. The drawing and measurements are based on sherds.

GRAVE LOT 10

Provenience: Burial 12, a 30 to 34 year old male. This is an incomplete grave lot. Most of the lower half of Burial 12 was destroyed by the intrusion of Historic Burial 77.

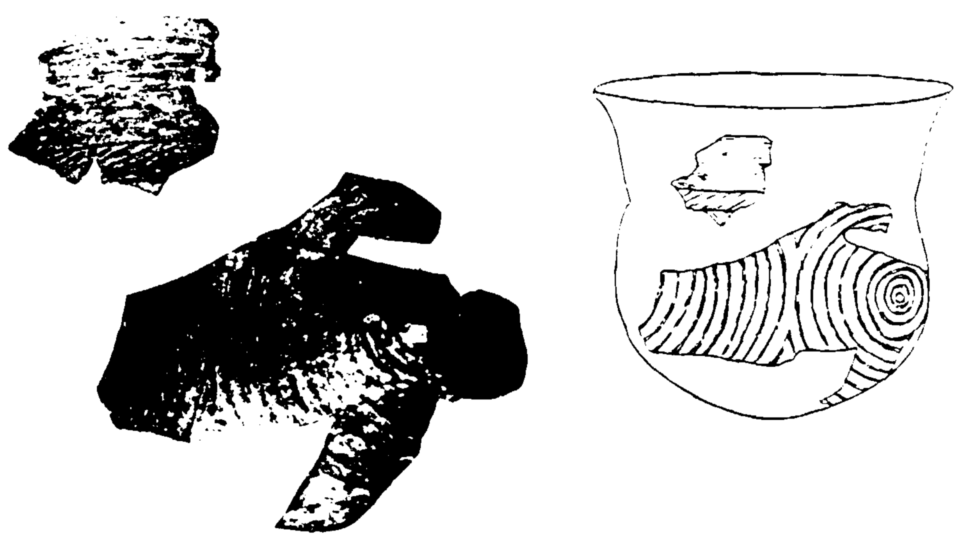


Figure 11-32. Pottery from Burial 11. Foster Trailed-Incised jar, var. Dobson

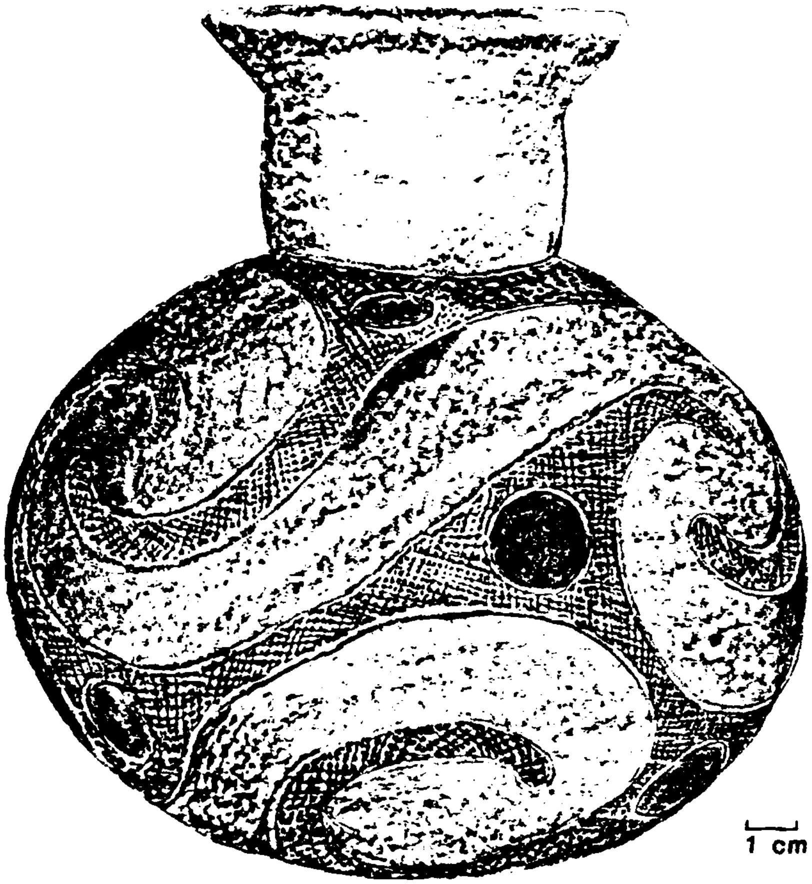


Figure 11-33. Pottery from Burial 11. Hodges Engraved bottles, var. Candler

Vessel 1

Illustration: Figure 11-34a
Type: Hodges Engraved bowl
Variety: Armour
Rim treatment: El Camino 2, a design featuring an interlocking scroll motif on a hatched background. The lines are filled with white pigment while the negative areas of the design have traces of red pigment on them.
Body treatment: plain
Temper: grog
Outside oral diameter: **between 250-280 mm based on** projections of rim sherds
Catalog number: 80-1209-1202
Photo number: 815515
Comments: Most of this bowl was cut away by the intrusion of Historic Burial 77.

Vessel 2

Illustration: Figure 11-34b
Type: Belcher Engraved bowl
Variety: Owen
Rim treatment: A Central 3 design with abundant white pigment in the rim and shoulder lines. There are traces of red pigment over the negative areas. The slanted line motif on the shoulder repeats four times. A fold at the shoulder line takes the place of the incised line seen on the interiors of some (later?) var. Owen vessels
Body treatment: plain
Temper: grog
Height: 85 mm
Outside oral diameter: 222 mm
Catalog number: 80-1209-1211
Photo number: 815532
Comments: The missing rim pieces were probably removed during the intrusion of Historic Burial 77.

Vessel 3

Illustration: Figure 11-35a
Type: Karnack Brushed-Incised jar
Variety: Karnack
Rim treatment: Austin 2, short vertical incisions under a heavy rolled lip
Body treatment: Danbury 1, fine vertical brushing
Temper: coarse shell
Height: 165 mm
Outside oral diameter: 143 mm
Catalog number: 80-1209-1201
Photo number: 815486
Comments: No signs of use or wear

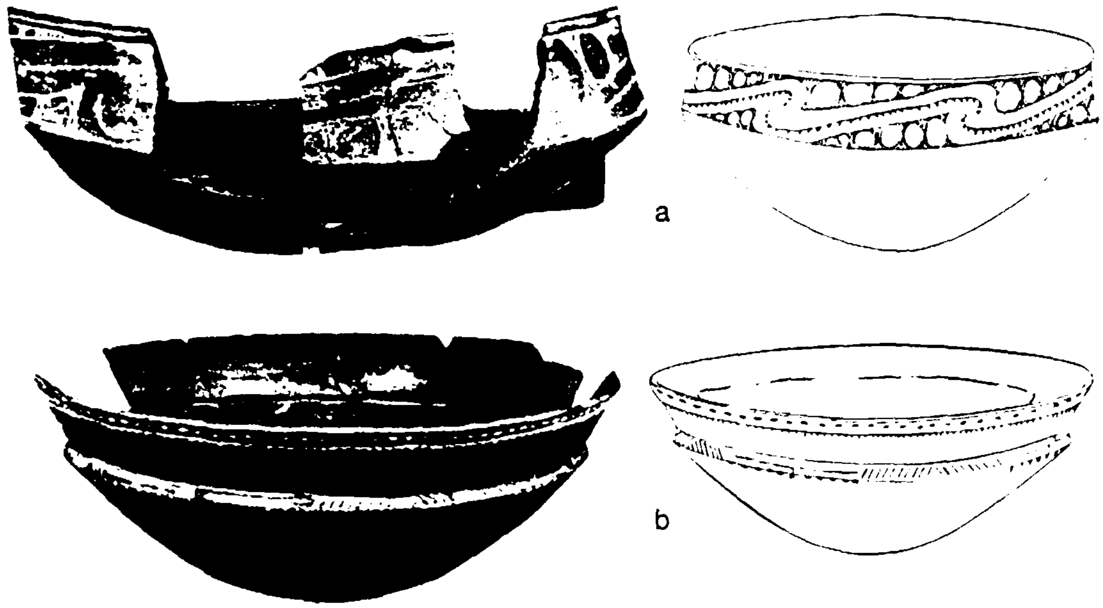


Figure 11-34. Pottery from Burial 12. a. Hodges Engraved bowl, var. Armour; b. Belcher Engraved bowl, var. Owen;

Figure 11-35. Pottery from Burial 12. a. Karnack Brushed-Incised jar, var. Karnack; b. Foster Trailed-Incised, var. Dobson

Vessel 4

Illustration: Figure 11-35b
Type: Foster Trailed-Incised jar
Variety: Dobson
Rim treatment: Agnes 2, a design with two bands of oblique incised lines and a panel of sloppy curvilinear incised lines in between.
Body treatment: Baker 3; a concentric circle design featuring very broad trailed lines. There are triple nodes at the center of each circle. The concentric circle motif is repeated four times.
Temper: very coarse shell
Height: 230 mm
Outside oral diameter: 275 mm
Catalog number: 80-1209-1039
Photo number: 815479
Comments: This pot was probably damaged by the intrusion of Historic Burial 77. Note the contrasting decorative techniques; the rim is incised, the body is trailed.

Vessel 5

Illustrations: Figure 11-36 and 37
Type: Glassell Engraved bowl
Variety: McGee
Rim treatment: Evan 1, a design based on a stylized interlocking scroll motif with double line background fillers, rather than hatching or crosshatching. The lines are filled with red pigment.
Body treatment: Ecanda 1; an interlocking scroll design with double line background fillers. The lines are filled with white pigment.
Temper: shell
Height: 86 mm
Outside oral diameter: 169 mm
Catalog number: 80-1209-1212
Photo numbers: 815493 and 815494
Comments: This is the outstanding example at this site of the trait of filling the rim design with red pigment and the body design with white pigment.

GRAVE LOT 11

Provenience: Burial 14, a 35 to 39 year old male. This grave lot is probably incomplete since Burial 14 was partially intruded by Historic Burials 11 and 23.

Vessel 1

Illustration: Figure 11-38a
Type: Avery Engraved bowl
Variety: Graves
Rim treatment: El Dorado 2, a concentric half circle design, with a crosshatched background. The "rising sun" motif is repeated four times.
Body treatment: Evansville 1, a concentric circle design with a crosshatched background. The concentric circle motif is repeated four times.
Temper: shell
Height: 97 mm
Outside oral diameter: 146 mm
Catalog number: 80-1209-1257
Photo number: 815528
Comments: No signs of use or wear on this vessel

Vessel 2

Illustration: Figure 11-38b
Type: Karnack Brushed-Incised jar
Variety: Karnack
Rim treatment: Austin 2, vertical incisions on a very short rim with a rolled lip.
Body treatment: vertical incision. Antioch 12; deep close spaced incised lines. Traces of red pigment on parts of the rim and body.
Temper: shell
Height: 114 mm
Outside oral diameter: 119 mm
Catalog number: 80-1209-1259
Photo Number: 815486
Comments: The red pigment on the rim and body is unusual for a coarse ware vessel and may be the result of something other than an attempt at decoration.

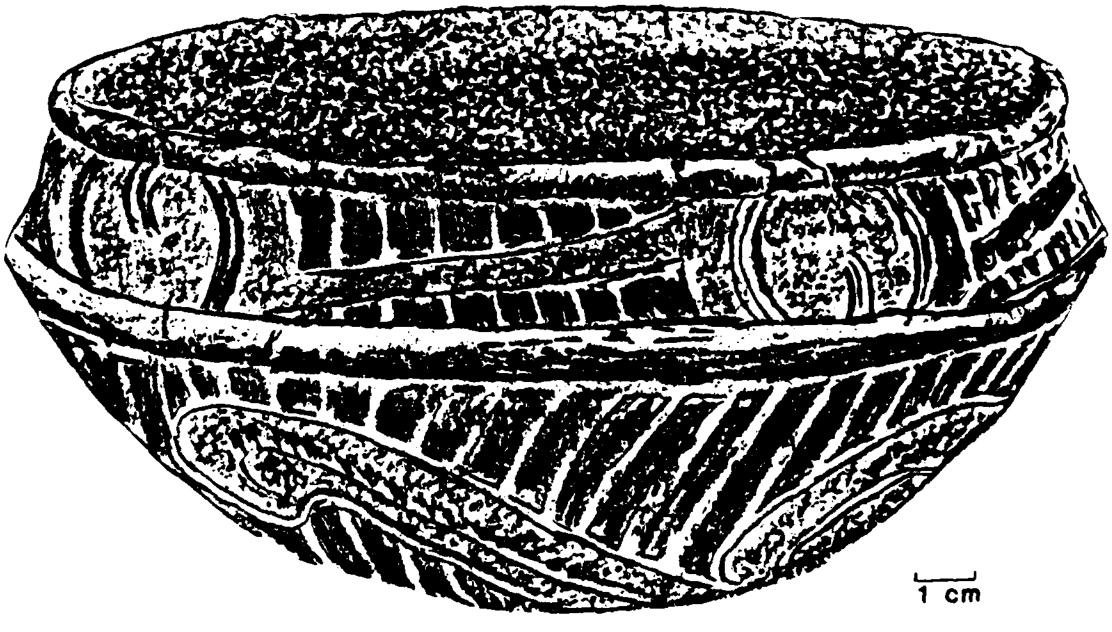


Figure 11-36. Pottery from Burial 12. Glassell Engraved bowl, var. McGee

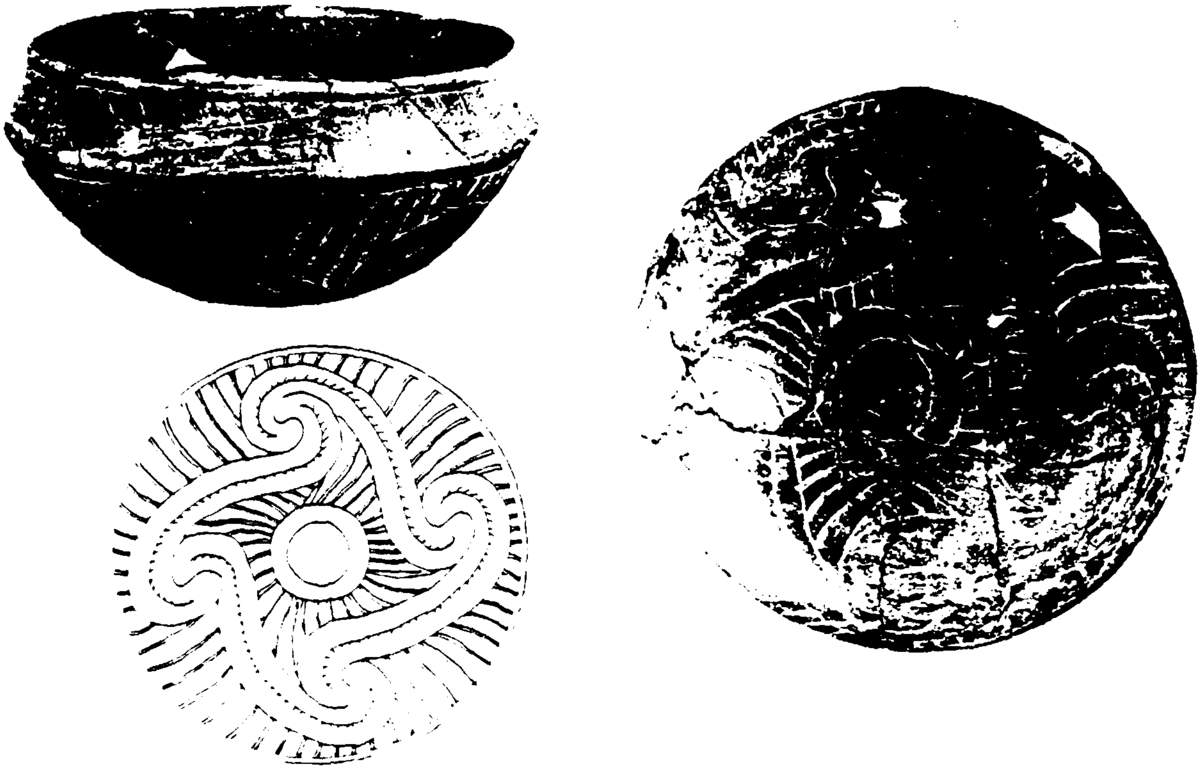


Figure 11-37. Pottery from Burial 12. Glassell Engraved bowl, var. McGee

Figure 11-38. Pottery from Burial 14. a. Avery Engraved bowl, var. Graves; b. Karnack Brushed-Incised jar, var. Karnack; c. Belcher Engraved bottle, var. Ogden

Vessel 3

Illustration: Figure 11-38c
Type: Belcher Engraved bottle
Variety: Ogden
Rim and neck treatment: plain straight neck, flaring rim
Body treatment: Elizabeth 2; a concentric circle design with "pinwheel" center elements. The concentric circle motif is repeated three times. There are traces of red pigment in the lines.
Temper: shell
Height: 206 mm
Maximum body diameter: 170 mm
Catalog number: 80-1209-1250
Photo number: 815491
Comments: No evidence of use or wear

Pipe

Illustration: Figure 11-39
Specimen: Pottery pipe
Description: This specimen has two "loops" attached to the base, a flaring bowl, a short stem and a flattened prow with six fingerlike projections (one is broken and missing). There is no carbon deposit in the bowl.
Temper: grog
Length: 75 mm
Outside oral diameter of bowl: 35 mm
Comments: This was the only pipe or pipe fragment found at Cedar Grove. Pipes seem to be scarce or absent at what we would regard as "normal" Caddo farmsteads located away from ceremonial centers. They appear to be good indicators of religious or important social activity. When found in graves, they should be considered evidence of some involvement by their owners in such activities. Wyckoff and Baugh (1980:243) list "pipes used in calumet ceremonies" as one of the material traits that might be associated with persons of the rank of Caddi among the Hasinai. We do not know that this would also be true of the Kadonadacho, or that the Caddices were the only persons to have pipes. We mention this to make the point that the presence of a pipe in a grave may be a better indication of high status, and perhaps of a significantly higher status, than the object itself might suggest.
This pipe was pierced by a probe, which was how this burial was found.

Vessel 4

Illustration: Figure 11-40a
Type: Foster Trailed-Incised jar
Variety: Foster
Rim treatment: Alfred 1; fairly wide spaced bands of zoned diagonal incising
Body treatment: Baker 4, a concentric circle design featuring broad trailed lines that are wide spaced, and triple center nodes. The concentric circle motif is repeated four times. There is a small patch of red pigment on the body.

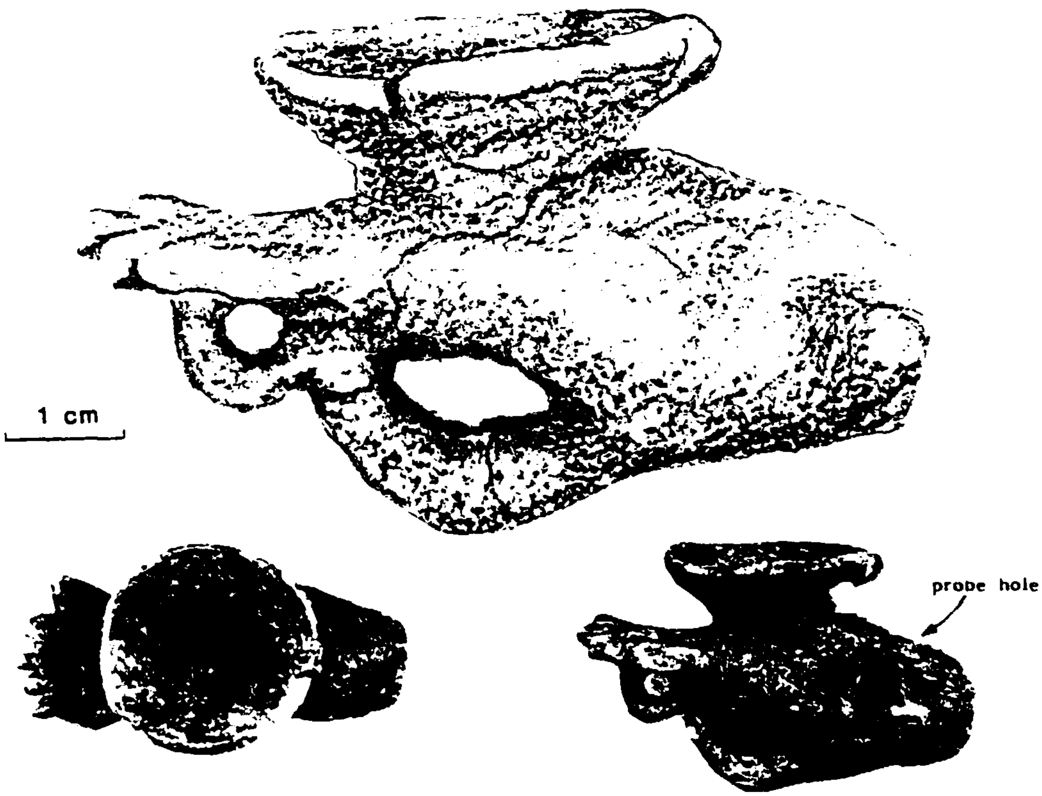


Figure 11-39. Pipe from Burial 14

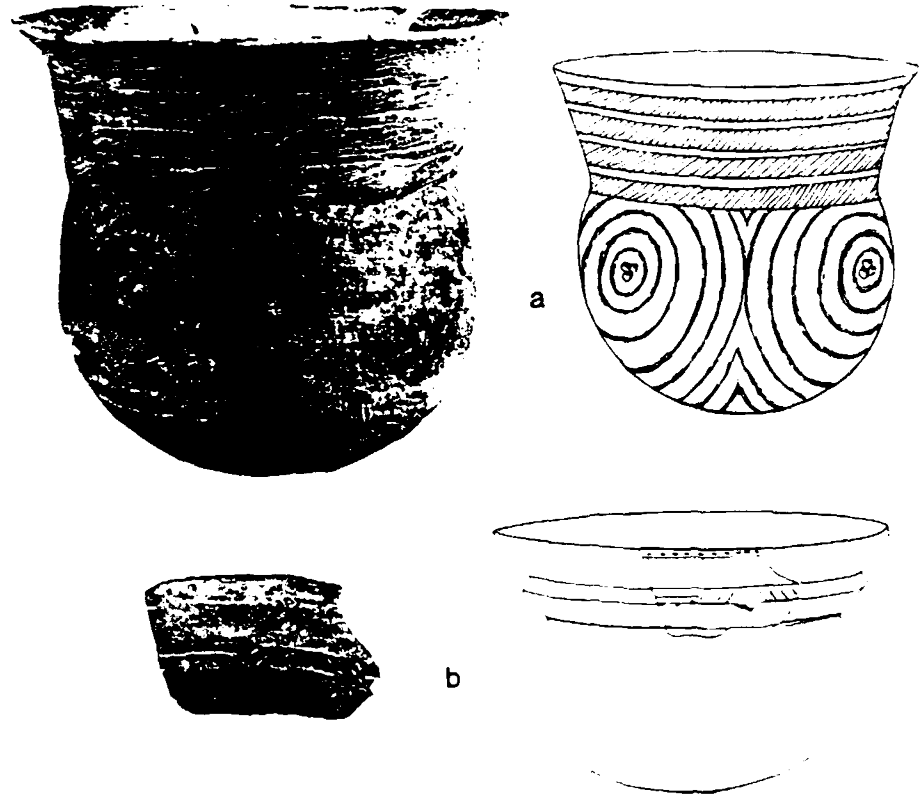


Figure 11-40. Pottery from Burial 14. a. Foster Trailed-Incised jar, var. Foster; b. rim and body sherd of Belcher Engraved compound bowl, var. Belcher

Temper: coarse shell
Height: 206 mm
Outside oral diameter: 227 mm
Catalog number: 80-1209-1251
Photo number: 815476
Comments: Parts of the upper two-thirds of the exterior of this specimen are coated with soot.

Vessel 5

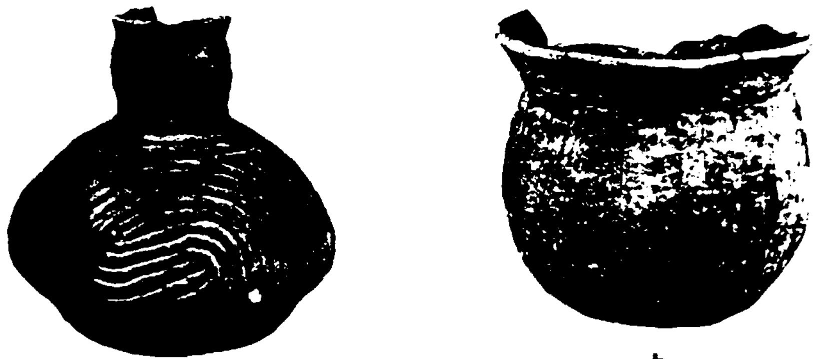
Illustration: Figure 11-40b
Type: Belcher Engraved compound bowl
Variety: Belcher
Rim treatment: A Central pattern, probably Central 5 because of the pronounced "lug" or node on the shoulder. There is white pigment in the lines.
Body treatment: Unknown, but there is just enough flare at the bottom of the sherd illustrated in Figure 11-40b to show that this was a compound vessel of the form illustrated.
Temper: grog
Catalog number: 80-1209-1258
Photo number: N/A
Comment: Most of this specimen was removed when Historic Burial 23 was dug.

GRAVE LOT 12

Provenience: Burial 15, a six year old child. Burial 15 was undisturbed prior to our test excavations. At that time the foot bones were struck and damaged by one of our shovel test pits, but no pottery was found. This grave lot is probably complete.

Vessel 1

Illustration: Figure 11-41a
Type: Keno Trailed bottle
Variety: McClendon
Rim and neck treatment: Plain, with a "spool neck" and a slightly flared rim
Body treatment: Belnaven 14, a design featuring vertically placed interlocking scrolls. This motif is repeated twice.
Temper: grog
Height: 109 mm
Maximum body diameter: 111 mm
Catalog number: 80-1209-1303
Photo number: 815524
Comments: This specimen has all the attributes of a good Keno Trailed-Incised var. McClendon bottle except it is much thicker and cruder than most specimens of this variety. It may have been made by the child with whom it was buried--this would indicate a high level of artistic skill and dexterity for a six year old—or it may



a b

Figure 11-41. Pottery from Burial 15. a. Keno Trailed bottle, var. McClendon; b. Karnack Brushed-Incised jar, var. Karnack

have come into the child's possession because of its generally inferior workmanship.

Vessel 2

Illustration: Figure 11-41b
Type: Karnack Brushed-Incised jar
Variety: Karnack
Rim treatment: Dana 4; light horizontal brushing
Body treatment: Danbury 1; well executed vertical brushing
Temper: coarse shell
Height: 82 mm
Outside oral diameter: 90 mm
Catalog number: 80-1209-1304
Photo number: 815518
Comments: The rim of this jar was damaged during excavation.

DESCRIPTION OF THE POTTERY FROM THE MIDDENS AND THE FEATURES

This collection contains 3,594 decorated sherds from all nonmortuary contexts. These sherds constitute 46.53% of the sortable sherd collection; 1,327 of them are fine ware (17.29% of the sortable sample) and 2,267 of them (29.5% of the sortable sample) are coarse ware. The classified sherd counts in the midden levels of the levee transect units and the features are presented in Appendix VIII.

Decorated Fine Ware Sherds

We were able to sort almost two-thirds of the 1,327 decorated fine ware sherds (802 sherds, or 60.44%) into six types: Avery Engraved, Belcher Engraved, Glassell Engraved, Hodges Engraved, Keno Trailed and Natchitoches Engraved (Table 11-3). Only 74 of the 802 typed sherds could be taken one step further, to the variety level, despite the large number of varieties we set up (Table 11-4).

Avery Engraved, represented by nine sherds (Figure 11-42) constitutes .68% of the decorated fine ware sherds and .12% of the sortable sherd collection. One rim-body sherd with Benedict 1::Eben 1 designs (Figure 11-2 and Figure 11-8) was identified as var. Bradshaw ("Benedict 1::Eben 1" is the standard form of notation developed for our new descriptive classification; in this instance it denotes a sherd with a Benedict 1 design on the rim and an Eben 1 design on the body. For details on this system, see Schambach 1981:114-117). A second sherd, with an Elliot 1 design was identified as var. Graves. Of the seven remaining sherds, one has an Eben 1 design. Another is probably part of an Ernest 1 design thus suggesting that the unusual Avery Engraved vessel from Burial 4, which we think may have been an import from east Texas or Oklahoma (Figure 11-16a), was not alone on the site.

Belcher Engraved sherds, of which there were 80 (Figure 11-43), constitute 6.03% of the decorated fine ware collection and 1.04% of the sortable sherd collection. Twenty-four of these sherds could be classified to variety. The Soda Lake bottle variety was recognized from one body sherd that shows part of an Elizabeth 1 design with its distinctive central element consisting of four triangles radiating from a disc (Figure 11-8). The Ogden bottle variety was recognized from two body sherds with Elizabeth 2 designs, which have the "pinwheel" central element diagnostic of this variety. Another 17 bottle sherds have designs of the Elizabeth pattern. This is diagnostic of Belcher Engraved in bottle form. But they fail to show any parts of the central elements of this pattern and that is what is critical in differentiating the Soda Lake variety from the Ogden variety. The Owen bowl variety was recognized from 21 rim-body sherds with various Central rim designs over plain bodies (Central::Plain) and—in all cases—with the incised line on the vessel interior at the shoulder that we consider diagnostic of Owen. Another 39 rim-body sherds have Central rim designs over plain bodies. This clearly identifies them as Belcher Engraved bowl fragments. But they all lack both the incised lines on the interiors at the shoulder joint that would identify them as var. Owen and the "quadrating nodes" that are diagnostic of the Belcher variety.

Glassell Engraved is represented by one sherd (.08% of decorated fine ware and .01% of the sortable sherd collection). This is a rim (Figure 11-44a) with a design of the Evan pattern (Figure 11-6). But not enough of the vessel remains to show whether it was a plain bodied bowl (as in Glassell Engraved, var. Atkins) or a bowl with a decorated body (as in Glassell Engraved var. McGee).

Hodges Engraved (Figure 11-45) is represented by 72 sherds (5.43% of the decorated fine ware sherds and .94% of the sortable sherd sample). All are from Hodges Engraved bowls. The lack of Hodges Engraved bottle sherds probably reflects nothing more than our inability to sort Hodges Engraved bottle sherds from Natchitoches Engraved bottle sherds. Hodges Engraved bottles must be represented in the sherd collection but all the sherds fall into our "Hodges Engraved-Natchitoches Engraved" category (see below). The Armour bowl variety is recognizable on three sherds, two with Esther 2 rim designs and plain bodies, and one with an El Camino rim design and a plain body (Figure 11-6). Four have Esther 1 rim designs and plain bodies.

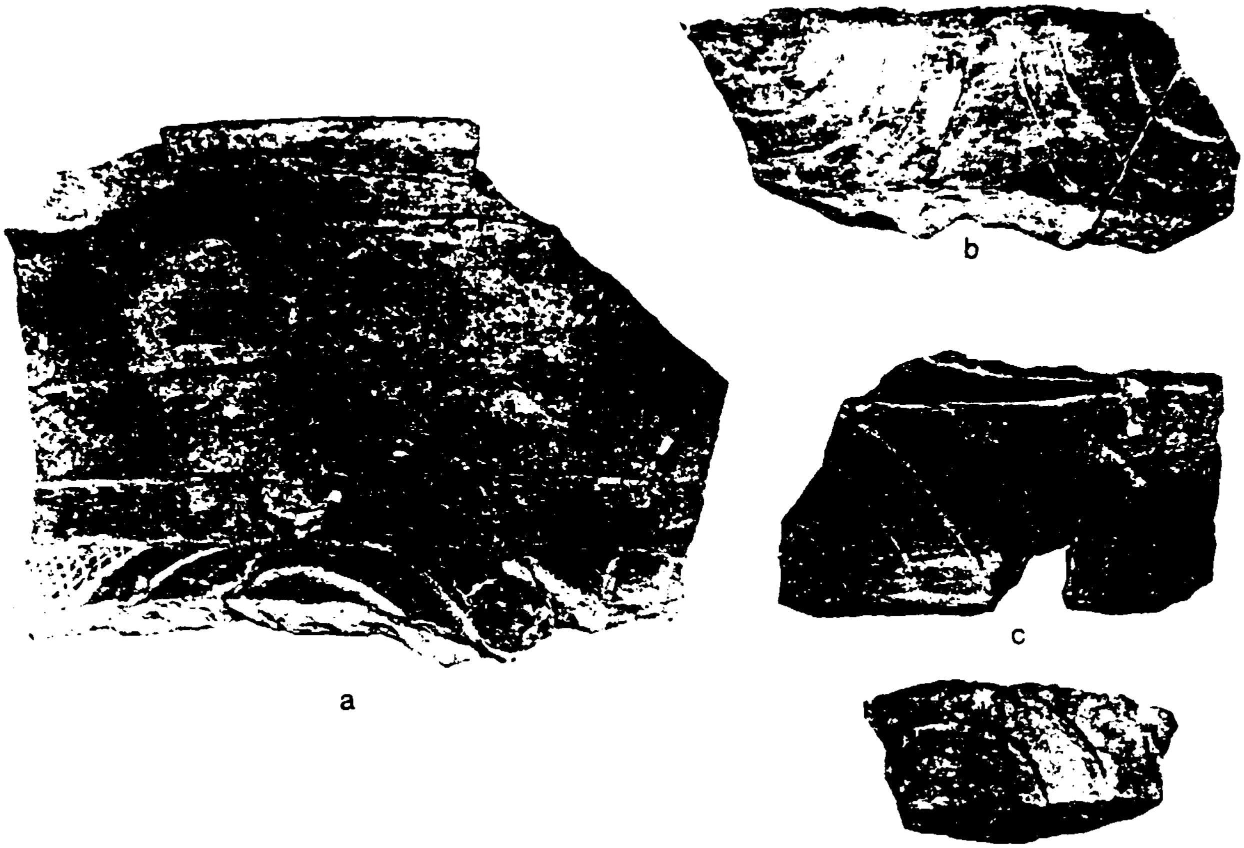


Figure 11-42. Typed fine ware sherds. a. Avery Engraved, var. Bradshaw; b. Avery Engraved, var. Graves; c. Avery Engraved, variety undeterminable (AAS negative numbers 822163, 822166, 820631)

Figure 11-43. Typed fine ware sherds. a. Belcher Engraved, var. Soda Lake; b. Belcher Engraved, var. Ogden; c. Belcher Engraved, var. Owen (AAS negative numbers 832032, 832033, 832034)

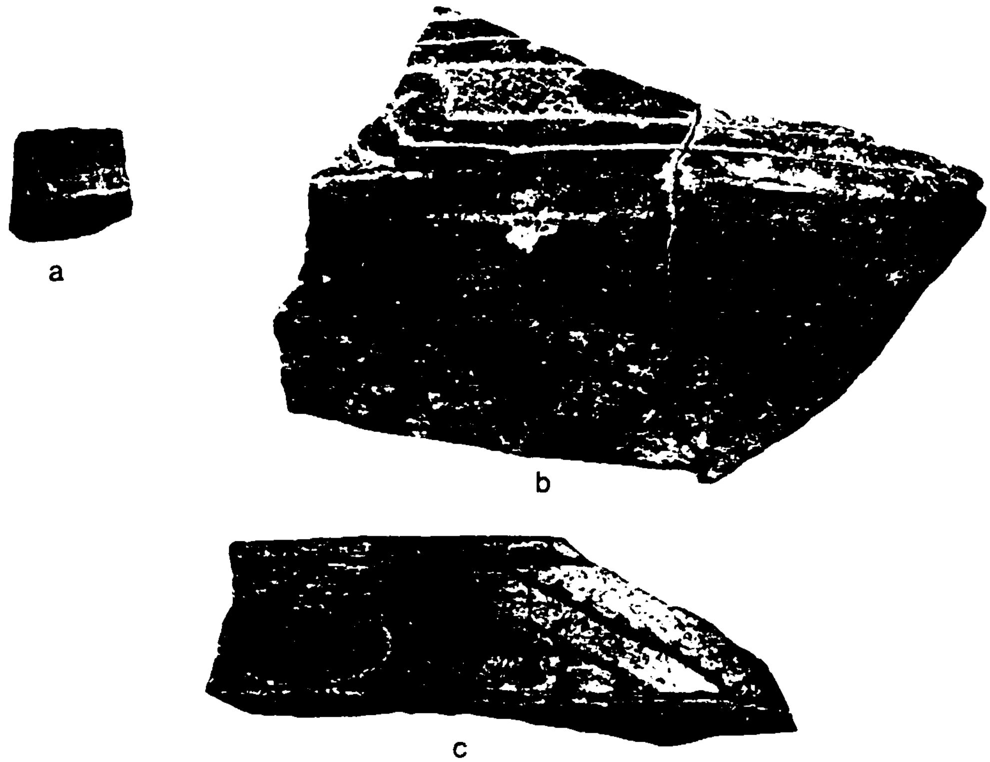


Figure 11-44. Typed fine ware sherds. a. Glassell Engraved; b. Hodges Engraved, var. Sentell; c. Hodges Engraved, var. Armour (AAS negative numbers 832035, 832036, 822164)

Figure 11-45. Typed fine ware sherds; Natchitoches-Hodges Engraved. a. bowl bottoms; b. bottle bodies (AAS negative numbers 832041, 832042)

The fifth has an as yet unrecorded rim design of the Esther pattern, and a plain body. The 64 remaining sherds are all rims with designs of the El Camino or Esther patterns (30 El Camino, 24 Esther, 10 Esther or El Camino; Figure 11-6) but none show enough of the bowl bodies to indicate whether they came from plain bodied bowls or bowls with decorated bodies. In the former case they would fall into the Sentell and Armour varieties. In the latter, they would fall into a significant but as yet unnamed decorated body variety of Hodges engraved bowls that we know is present at this site and elsewhere in the Spirit Lake locality. C. B. Moore (1912:592, Figure 63, vessel 13) illustrated one vessel of this configuration (an El Camino rim and a decorated body) from the Battle site. And in the Cedar Grove collection we have one sherd showing an Esther 1 rim design and a decorated body (see below, miscellaneous decorated fine wares, Category 2).

Keno Trailed is represented by 346 sherds (Figure 11-46). It accounts for 4.51% of the sortable sherd collection and 25.07% of the decorated fine ware, meaning it dominates the decorated fine ware sherd collection. Only one Keno sherd could be classified to variety, a rim and body sherd from a var. Phillips beaker with a good Blackburn 1 design (Figure 11-3). Most of the remaining 345 sherds are probably from vessels of the McClendon, Scott's Lake, and Glendora varieties.

Natchitoches Engraved, represented by 89 sherds, accounts for 1.16% of the sortable sherd collection and [illegible]% of the decorated fine ware. All sherds are clearly bowl sherds (Figure 11-47). If there are any Natchitoches Engraved bottle sherds they are in our Hodges-Natchitoches category because, as we point out in the discussion of Hodges Engraved, we cannot sort Hodges Engraved bottle sherds from Natchitoches Engraved bottle sherds. There are 22 sherds of the Lester Bend bowl variety and 16 sherds of the Natchitoches bowl variety. All 22 sherds of the Lester Bend variety are from bowls with the Central rim designs and the shouldered form typical of both Belcher Engraved var. Owen and Natchitoches Engraved var. Lester Bend (Figure 11-11). All 16 sherds of the Natchitoches variety are from bowls of the helmet shape that is generally considered characteristic of Natchitoches Engraved. There are 51 Natchitoches Engraved sherds that cannot be classified to variety. All are red slipped and 35 have the same distinctive yellow paste as Vessel 1 from Burial 10, a red slipped Natchitoches Engraved bowl of an unnamed variety (Figure 11-27a). We consider it an import from the Keno-Glendora locality in the Boeuf region in the lower Ouachita Valley; the same may be true of the vessels that produced these 35 sherds.

Natchitoches Engraved or Hodges Engraved

All 205 sherds in this group come from either bottle bodies (at least 61) or bowl bodies (at least 83; Table 11-5). They could be from Hodges Engraved bottle varieties Candler or Kelly's Lake, from Natchitoches Engraved bottles of several unrecognized varieties, from Hodges Engraved bowls or from the Natchitoches Engraved bowl varieties Lester Bend and Natchitoches.

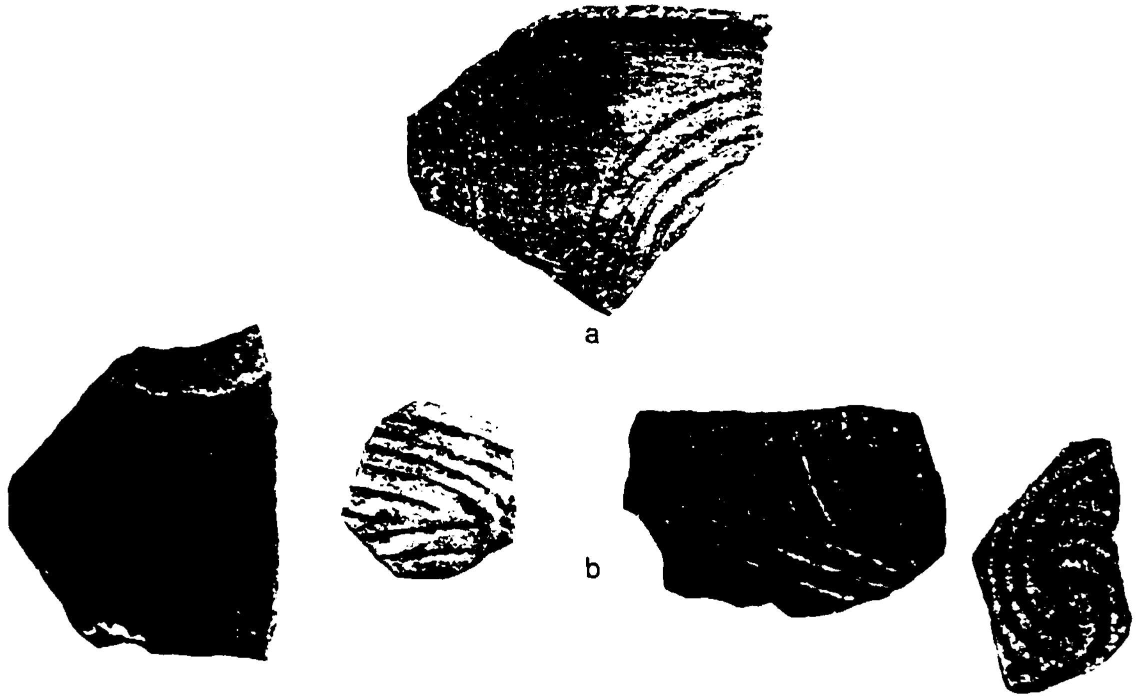


Figure 11-46. Typed fine ware sherds. a. Keno Trailed, var. Phillips; b. Keno Trailed, variety indeterminable (AAS negative numbers 832037, 832038)

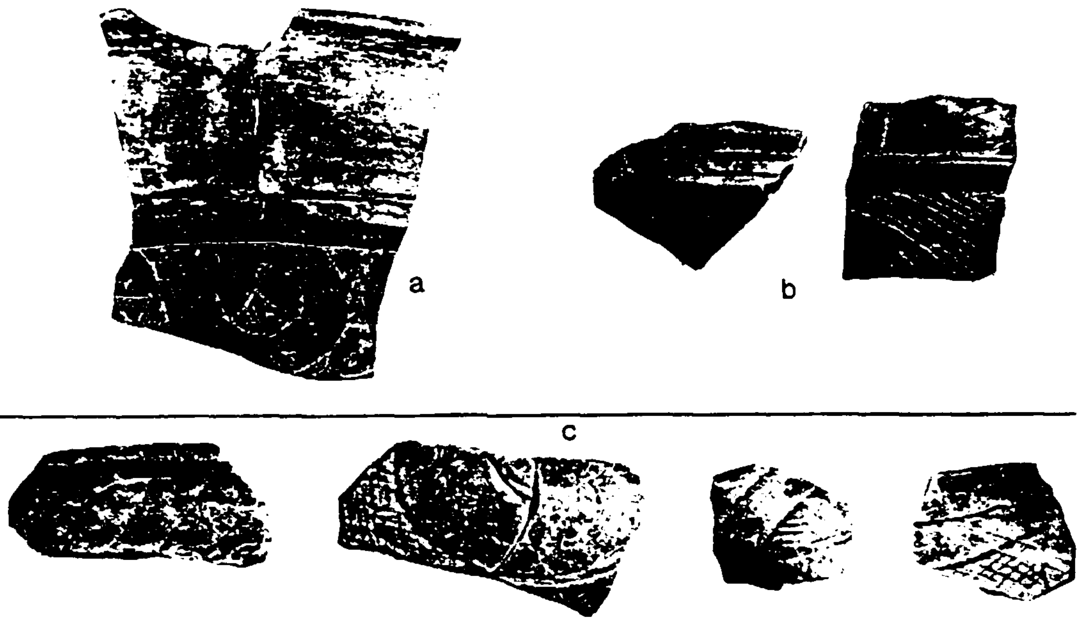


Figure 11-47. Typed fine ware sherds. a. Natchitoches Engraved, var. Lester Bend; b. Natchitoches Engraved, var. Natchitoches; c. Natchitoches Engraved, var. unknown (red-slipped) (AAS negative numbers 832161, 822039, 832040)

Table 11-5. Breakdown of design elements and vessel forms and parts represented by sherds of the Hodges Engraved-Natchitoches Engraved category

Vessel Shapes and Parts Identified			Design Elements Visible on Sherds					
Bowl or Bottle Bodies	Bottle Bodies	Bowl Bottoms	Cross	Hatching Zoned	Hatching Simple	Ball	Ticked Line	Curvilinear Ticked Line
	1	5	x			x	x	
[illegible]	7	18	x				x	
9	15	11	x			x		
25	28	10	x					
	1	5			x	x	x	
	2	8			x	x		
17	9	10		x				
		7						x*

*parts of interlocking scroll design elements

Table 11-6. Untypable decorated fine ware sherds classifiable to descriptive categories only

Temper	Incised/Engraved Simple	Incised/Engraved Compound	Ticked Line	Crosshatched	Central:: Bottomless	Notched Lip	Punctated Rim
Shell	11	5	7	5	18		
Grog	32	11	8	9	22		
Bone							
Not visible	89	80	52	43	100	1	1
Total	132	96	67	57	140	1	1

Untypable Decorated Fine Ware Sherds

There are 494 sherds that do not show enough decoration to be classified to type. We have divided these into seven descriptive categories based on surface finish and decoration (Table 11-6). All sherds in this group appear to be from types and varieties already recognized at Cedar Grove. Nothing new seems to be hidden here.

Category 1 consists of 132 "simple" incised or engraved sherds. These bear parts of designs employing single or multiple nonintersecting lines. Thirty-seven are rim sherds with one or more horizontally incised lines; 48 are nonrim sherds with one or more straight lines, and 47 are nonrim sherds with one or more curvilinear lines.

Category 2 consists of 96 "compound" incised or engraved sherds. These bear parts of designs employing diagonally opposed lines or intersecting lines.

Category 3 consists of 67 sherds showing parts of designs that involve ticked lines. Ticked lines are a major design element in four types identified at Cedar Grove: Cabaness Engraved, Hodges Engraved, Natchitoches Engraved and Avery Engraved. Sherds in this category are probably from vessels of one of these types.

Category 4 consists of 57 sherds showing parts of designs that employ crosshatched backgrounds. This background treatment is shared by several types at Cedar Grove, so a small residual category of untypable crosshatched sherds is expected.

Category 5 consists of 140 rim sherds of the Central pattern. All of these could easily be classified as Belcher Engraved bowl rims, were it not for the fact that this rim pattern is shared with the Lester Bend variety of Natchitoches Engraved bowls (see Figure 11-11). Therefore these rims cannot be classified to type (although they can obviously be handled with ease and precision in our descriptive classification system) unless enough of the bowl base is present to show whether it was plain, as in Belcher Engraved or decorated as in Natchitoches Engraved. This is a large number of sherds to leave untyped because of what *seems to be a mere technicality* in the application of the type-variety classification. But if we try to correct the typology by making Lester Bend a variety of Belcher Engraved rather than of Natchitoches Engraved, we then render all rimless Natchitoches Engraved body sherds unsortable to type. This is a good example of the kind of recurring dilemma in Caddo ceramic typology that led us to begin to develop the rim-body oriented descriptive classification system briefly discussed earlier in this report.

Twenty-seven specimens in this group of Belcher Engraved or Natchitoches Engraved rim sherds show the incised line on the vessel interior at the shoulder that is characteristic of both Belcher Engraved var. Owen and Natchitoches Engraved var. Lester Bend. The other 113 are broken too high above the shoulder to show this line. They could have come from bowls of either of the above types or from bowls of the somewhat earlier Belcher variety of Belcher Engraved which lacks the interior line.

Category 6 consists of one small plain rim sherd with a notched lip. This is probably from a Keno Trailed var. Phillips beaker but since none of the body design, if there was one, is showing we cannot rule out the possibility that it was from a vessel of some other type or variety.

Category 7 consists of one punctated rim. This is identical to the rim on the Avery Engraved bowl (Vessel 5) from Burial 4 (Figure 11-16a).

Miscellaneous Decorated Fine Ware

This group consists of 14 small categories of untypable sherds (31 in all; see Table 11-7) that require brief individual consideration because they appear to be from vessels of types or varieties not otherwise identified at Cedar Grove.

Category 1: One rim sherd (Figure 11-48a) with a narrow, slightly curved band of zoned crosshatching descending from the vessel lip. This could be from a Hudson Engraved or Maddox Engraved vessel or it could be from a vessel similar to an untyped bowl from the Glendora site illustrated by C. B. Moore (1909:Plate III, Vessel 130).

Category 2: One bowl rim sherd (Figure 11-48b) with an Esther 1 design on the rim and an unrecorded design on the body. It may represent an unnamed local variety of Hodges Engraved.

Category 3: Three rim sherds from three different bowls (Figure 11-48c). The designs are similar to designs of the Central pattern (Figure 11-4) but the rim profiles are clearly of the recurved form typical of bowls with El Camino, Esther and Evan designs. An unrecognized type or variety is probably involved here.

Category 4. One bowl rim sherd with an unrecorded rim design consisting of two horizontal ticked lines above a row of punctates (Figure 11-48d). It may belong to an unrecognized local variety of Means Engraved.

Category 5: One bowl sherd with fragments of complex zoned crosshatched and ticked line designs on both the exterior (Figure 11-48e) and the interior (Figure 11-48f).

Category 6: Three sherds forming a fragment of a vessel that is probably a specimen of the rare Hodges Engraved vase form illustrated by Suhm and Jelks (1962:Plate 37O) from Hot Spring County, Arkansas, and by C. H. Webb (1957:Figure 69b) from the Belcher site (Figure 11-48g).

Category 7: Six bowl rim sherds with fragments of unrecorded designs composed of ladderlike line elements (Figure 11-48h). These could be from an unrecorded variety of Glassell Engraved bowls (Figures 11-36 and 11-37).

Category 8: A unique jar sherd with a tool punctated rim and an unrecognized incised design on the body (Figure 11-48i). The small node on the lip is similar in shape and placement to those on certain Hodges Engraved bowls (see Webb 1959:Figure 73b).

Category 9: A fragment of a small untyped plain bowl with a scalloped rim (Figure 11-48j).

Category 10: Two fragments of effigy bowls. One is a bird tail from a rim adorno. The other is a fragment of an appliqued arm or leg from a human or animal effigy bowl (Figure 11-48k).

Category 11: An engraved bowl rim of unknown type (Figure 11-48l).

Category 12: A rim sherd from a compound bowl with horizontally incised lines on the shoulder (Figure 11-48m).

Category 13: Eight sherds with ticked line designs. These could be from Means Engraved, Glassell Engraved or

Table 11-7. Miscellaneous decorated fine ware sherds classifiable to descriptive categories only

Temper Category	Decorative Category Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Shell										1			1	
Grog		1					2				1	1		
Bone														
Not visible	1		3	1	1	3	4	1	1	1			7	1
Total	1	1	3	1	1	3	6	1	1	2	1	1	8	1

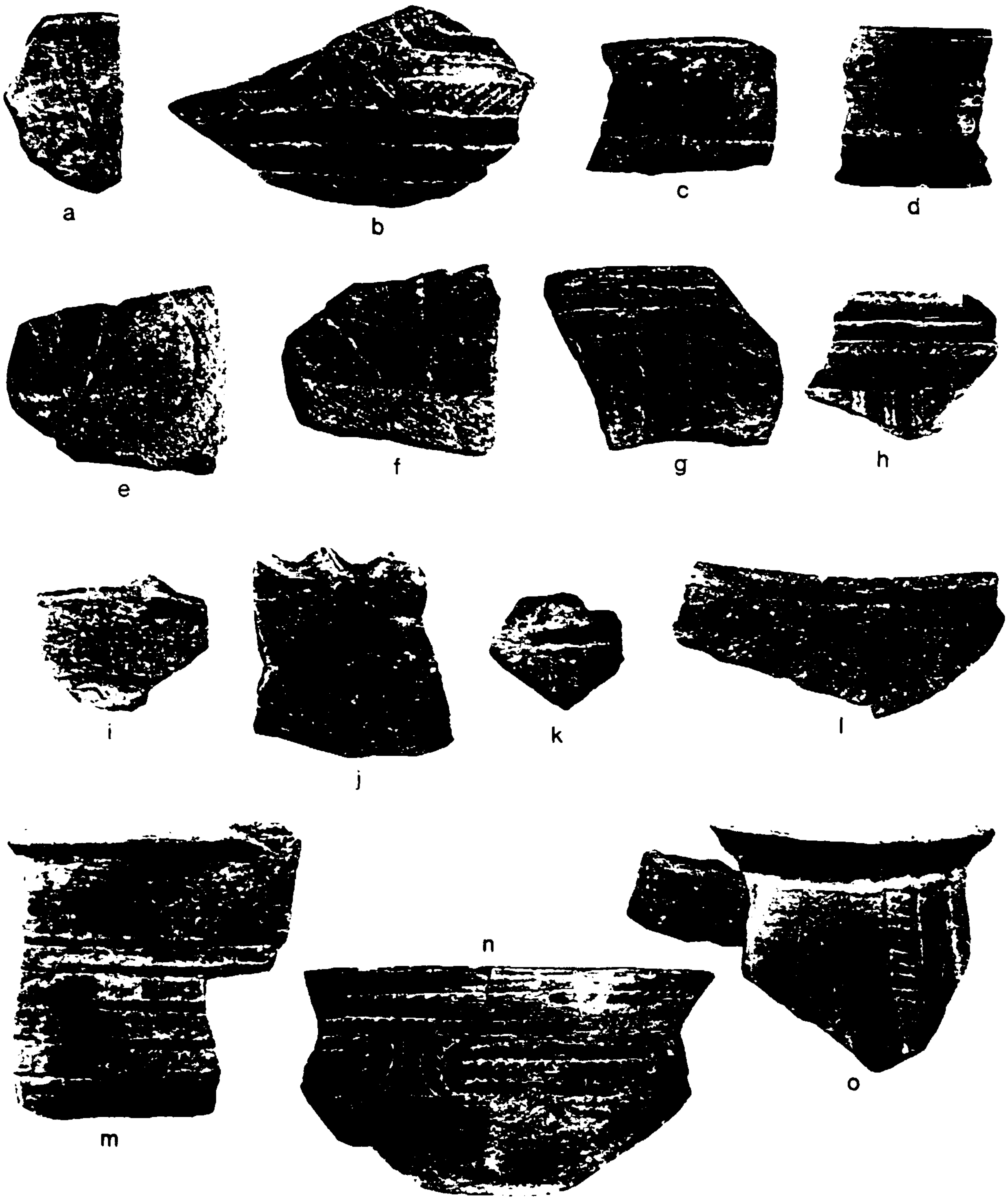


Figure 11-48. Miscellaneous decorated fine ware sherds (AAS negative number 832015-832020, 832027, 815530, 822165). a. Category 1; b. Category 2; c. Category 3; d. Category 4; e,f. Category 5; g. Category 6; h. Category 7; i. Category 8. j. Category 9; k. Category 10; l. Category 11; m. Category 12; n. Category 13; o. Category 14.

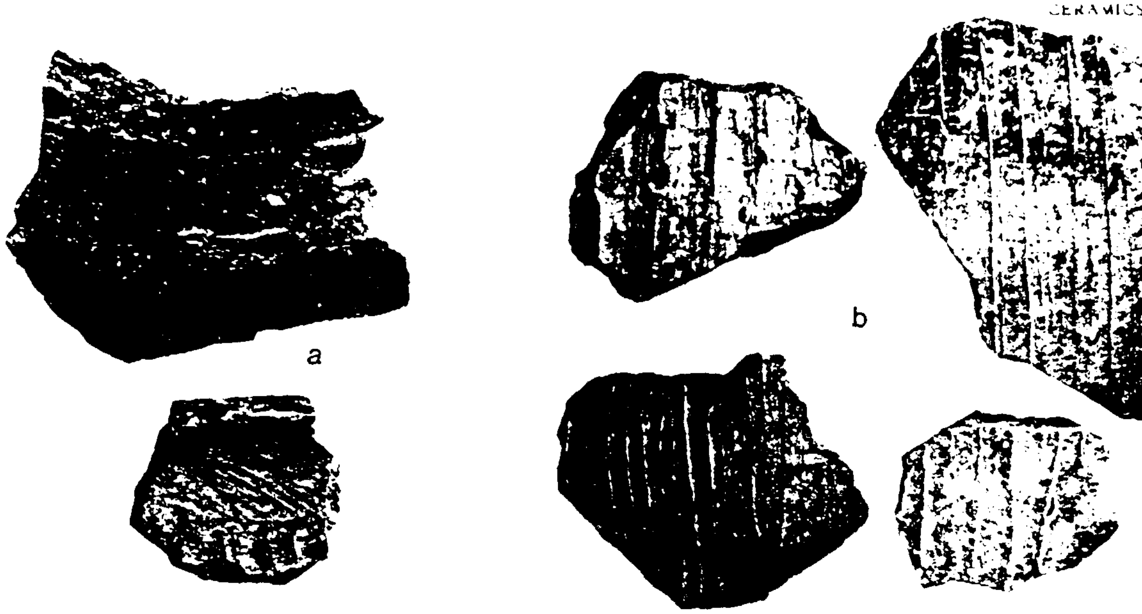


Figure 11-49. Typed coarse ware sherds. a. Belcher Ridged, var. Wilson's Island; b. Belcher Ridged, variety undeterminable (AAS negative numbers 832044, 832043)

[illegible] Engraved vessels (Figure 11-48n).

Category 14: A rim sherd of a small untyped jar with vertical bands of zoned crosshatching (Figure 11-48o).

Decorated Coarse Ware Sherds

A little more than one-third of the 2,2[illegible] sherds of decorated coarse ware pottery (83[illegible] sherds or 36.7[illegible]%) were sortable to three types: Belcher Ridged, Foster Trailed-Incised and Karnack Brushed-Incised. Only 2[illegible] sherds were further sortable to variety (Table 11-8).

Belcher Ridged sherds, of which there are 325, constitute 14.3[illegible]% of the decorated coarse ware sherd collection and 4.23% of the sortable sherd collection (Figure 11-49). Only seven of these are rim-body sherds and thus classifiable as to variety. All seven have the brushed rims diagnostic of the Wilson's Island variety. (Five have Dewey [illegible] rims over Hamilton 1 bodies; one has a Dewey 3 rim over a Hamilton 1 body and one has a horizontally oriented brushed herringbone design of an unrecognized pattern over a Hamilton 1 body.) The remaining 318 specimens are body sherds with Hamilton designs.

Foster Trailed-Incised is represented by 501 sherds. It accounts for 6.53% of the sortable sherd collection, 13.9% of all the decorated sherds and 14.41% of all the coarse ware sherds. In other words, Foster Trailed-Incised [illegible]ates the Cedar Grove sherd collection. Furthermore [illegible] in spite of the fact that most of our [illegible] are based on rim sherds (460), or rim-body [illegible] 26 are based on body sherds. It is [illegible] of the 43[illegible] untypable incised sherds [illegible] are Foster Trailed-Incised, as are probably [illegible] sherds. The former are untypable [illegible] come from Karnack [illegible] vessels. The latter are [illegible] sherds too small to show the [illegible] of Foster Trailed-Incised [illegible] of Karnack Brushed [illegible] evident scarcity of the Fish [illegible] fit as a trailed line variety in the brushed or incised line type Karnack Brushed-Incised, and the tremendous toll in sherd sortability entailed in keeping it in that type, all indicate that we should consider moving it over to the type Foster Trailed-Incised. But that is not a problem that should be dealt with in a site report.)

Only 14 Foster Trailed-Incised sherds show enough rim and body decoration to be classified to variety (Table 11-8). Seven are var. Dixon, three are var. Dobson, one is var. Finley, two are var. Moore and one is var. Shaw (Figure 11-50). This is a poor showing on the part of the type-variety system; it tells us little about the large Foster Trailed-Incised sherd collection other than to suggest that the Dixon variety was probably the most important one at the site. Fortunately we can get more information from these sherds by resorting to the descriptive classification system and looking at the rim patterns. This tells us that Dixon, Shaw, and Moore are far and away the major varieties (represented by 431 sherds out of 460) while rim patterns characteristic of the Foster and Red Lake varieties, which would be easy to spot in sherd form, are weakly represented. To elaborate, 300 of the 460 rim sherds have the unzoned diagonal incising characteristic of the Agnes pattern (Figure 11-1). Since we have, thus far, only seen the Agnes pattern on rims of var. Dixon vessels, it is a safe guess that this variety was the dominant one at Cedar Grove. Another 131 rim sherds are of the unzoned-punctated Chattanooga pattern. The majority of these, at least 114, are clearly from vessels of either the Moore or Shaw varieties, making them the next two most common in this collection. On the other hand, vessels of the Foster and Red Lake varieties are only represented by 12 rims, those that fit the Alfred pattern (five have Alfred 4 designs, seven have Alfred 2 or 3 designs). A residual category of 17 rims contains specimens that are incised, but do not show enough design to indicate whether they fit the zoned Alfred pattern or the unzoned Agnes pattern. These rims could have come from vessels of the Dixon, Foster, or Red Lake varieties.

The 26 body sherds of Foster Trailed-Incised are so classified because they all have the central nodes of the concentric circle or volute designs that are a major

Table 11-8. Decorated coarse ware sherds classifiable to type and variety

	Belcher Ridged		Foster Trailed-Incised							Karnack Brushed-Incised		
Temper	Wilson's Island	Undet.	Dixon	Dobson	Finley	Moore	Shaw	Unknown	Undet.	Karnack	Unknown	Undet.
Shell	5	149	7	3	1	1	1		465	1		3
Grog	1	93							92			
Bone	1											
Not visible		76				1		1	9	1	1	2
Total	7	318	7	3	1	2	1	1	486	2	1	5

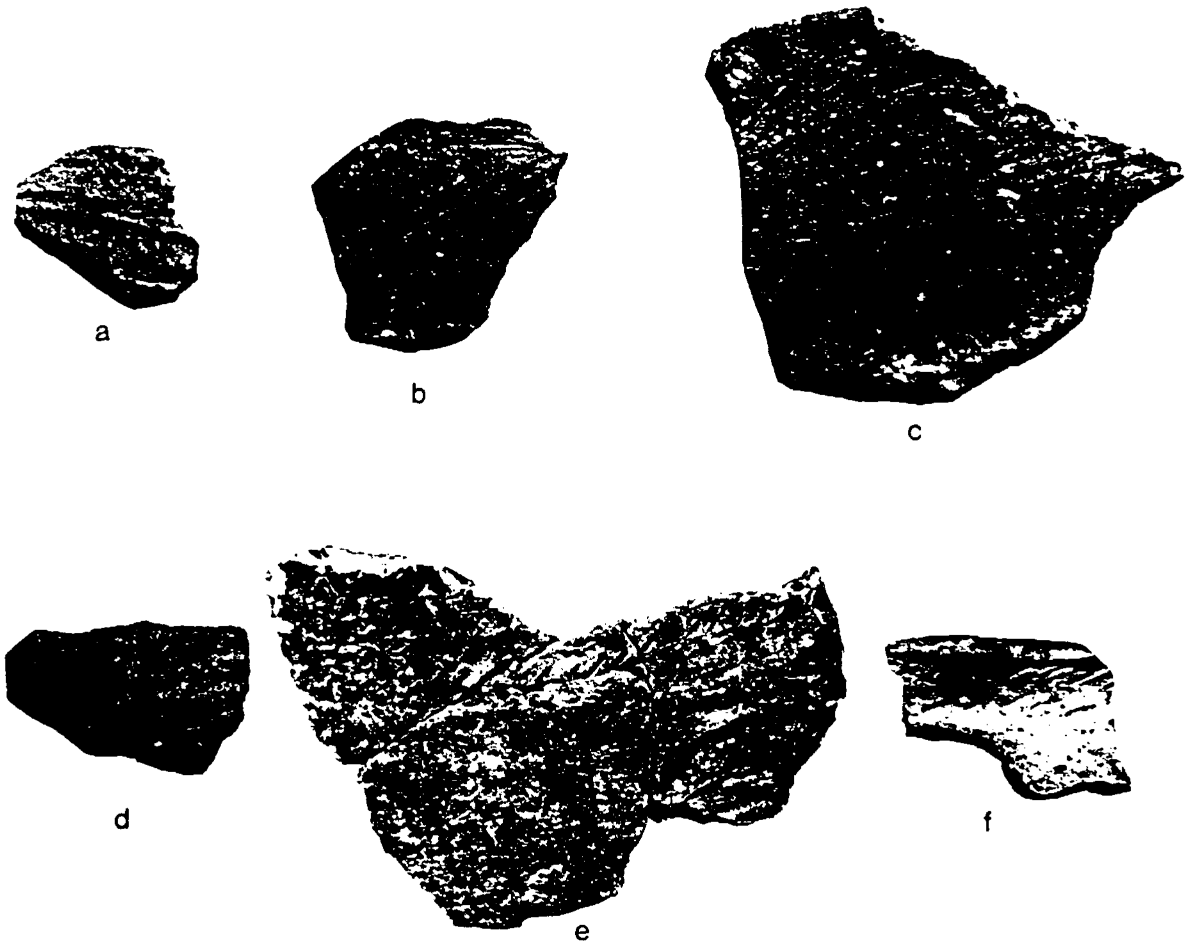


Figure 11-50. Typed coarse ware sherds. a. Foster Trailed-Incised, var. Dixon; b. Foster Trailed-Incised, var. Dobson; c. Foster Trailed-Incised, var. Finley; d. Foster Trailed-Incised, var. Moore; e. Foster Trailed Incised, var. Shaw; f. Foster Trailed-Incised, var. unknown (AAS negative numbers 832045-50)

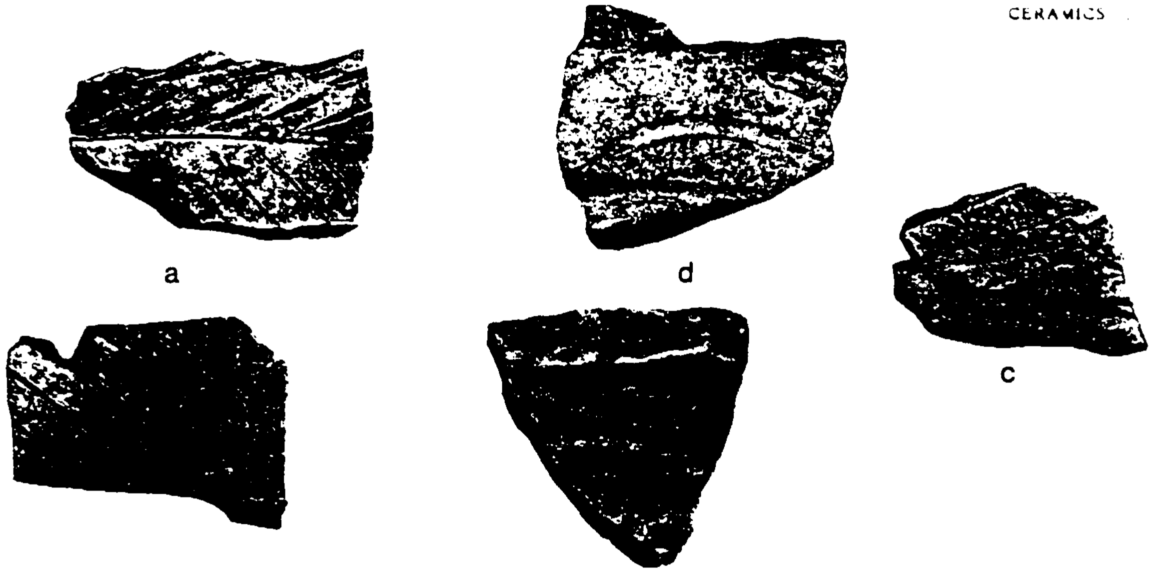


Figure 11-51. Miscellaneous decorated coarse ware sherds (AAS negative numbers 832028-832030). a. Category 7; b. Category 8; c. Category 9.

diagnostic of this type. Twenty sherds have the flattened circular nodes diagnostic of the Dixon, Moore, or Shaw varieties; three have the nipplelike nodes characteristic of the Dobson variety, and three have a unique quadrated node that we have not yet seen on any whole vessel from the Great Bend region. There are no sherds with the triple nodes characteristic of the Foster variety.

Karnack Brushed-Incised, which is well represented by [illegible] whole vessels in the mortuary collection, is seriously underrepresented in the sherd collection where we find only eight specimens. This is probably because it is impossible to make positive identification of this type from anything less than either whole vessels or rim-body sherds, and the latter have a very low survival rate in village middens, as do rim-body sherds of any coarse ware type. Many of the 493 untypable incised sherds and of the 186 untypable brushed sherds described below must be from Karnack Brushed-Incised vessels.

Untypable Decorated Coarse Ware

We have divided the 1,433 decorated coarse ware sherds that could not be typed into nine descriptive categories based on surface finish and on the vessel parts represented (Table 11-9).

Category 1 consists of 186 brushed sherds that could have come from any part of a vessel rim or body except the lip, although most are probably body sherds. Two of these show curvilinear brushing, eight show "compound brushing" (i.e., designs involving diagonally opposed lines) and the remaining 176 show "simple" brushing (i.e., all the lines on the sherd run in the same direction; see Figure 11-5b, the Danbury 1 body design). Many Caddo coarse ware types use brushing to some extent. At Cedar Grove the temporal context is clear enough that we can narrow the range of types probably represented to two: Karnack Brushed-Incised, which would probably account for most of the simple brushed body sherds, and Foster Trailed-Incised, where we find both curvilinear and compound brushing on the Alaska rim pattern (Figure 11-52) characteristic of some vessels of the Dobson variety. Of course, we cannot completely rule out the possibility that some or all of the six bone-tempered sherds or the 29 grog tempered sherds (Table 11-9) are from vessels of somewhat earlier brushed types such as Bossier Brushed (in particular) or Pease Brushed-Incised (a more remote possibility).

Category 2 consists of 22 brushed rim sherds. Seventeen of them fit various designs of the Dewey pattern in our descriptive classification (Figure 11-5a): 10 are Dewey 2 (a rolled lip and diagonal brushing); four are Dewey 1 (a rolled lip and horizontal brushing) and three are

Table 11-9. Untypable decorated coarse ware categories classifiable to descriptive categories only

Temper	Brushed Sherds	Brushed Rims	Incised sherds	Incised Rims	Trailed Sherds	Fingernail Punctated Sherds	7	8	9
Shell	138	13	344	72	604	3			1
Grog	29	1	54	3	11	1	3	2	
Bone	6	1	2		5				
Not Visible	13	7	93	3	18		6		
Total	186	22	493	78	638	4	9	2	1

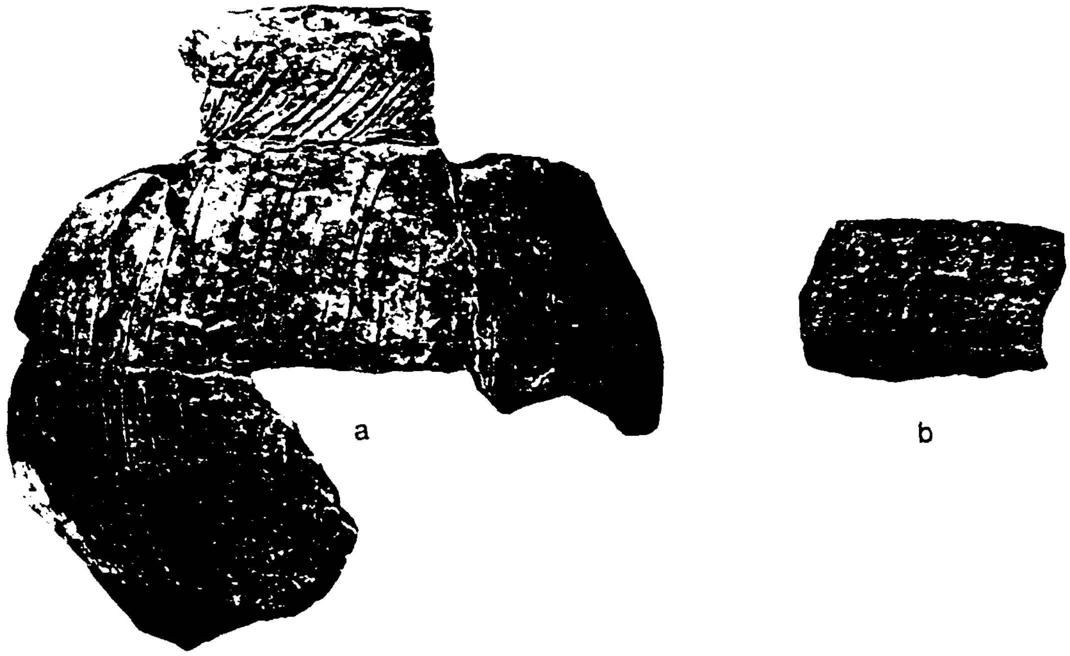


Figure 11-52. Typed coarse ware sherds. a. Karnack Brushed-Incised, var. Karnack; b. Karnack Brushed-Incised, var. unknown (AAS negative numbers 822162, 832051)

Dewey 3 (a rolled lip and vertical brushing). Dewey rim designs *commonly occur* on vessels of the type Belcher Ridged (var. Wilson's Island). But we think that they may also occur on Karnack Brushed-Incised vessels, a probability that renders these 17 Dewey rims unsortable to type. Two other sherds in this category fit the Dana 4 rim design (horizontal brushing on a straight rim; Figure 11-5a). They could be from Belcher Ridged or Karnack Brushed-Incised vessels, or some other type. The three remaining sherds include two compound curvilinear brushed specimens from a vessel of unknown type and a horizontally brushed specimen of an unknown pattern and type.

Category 3 consists of 493 incised sherds. Four hundred and thirty-five of these are "simple incised," meaning all the lines on a sherd are straight and go the same way. Many sherds in this category must be from the bodies of Karnack Brushed-Incised vessels. Others could be body fragments of vessels of the Shaw variety of Foster Trailed-Incised or, in the case of the smaller sherds, rim fragments of the Foster Trailed-Incised varieties Dixon, Red Lake, Foster, and Finley.

Category 4 consists of 78 small incised rim sherds that are too small for recognition of complete designs, let alone types or varieties. All, however, have diagonal incising so they are most likely from rims with designs belonging to patterns already *recognized at Cedar grove, namely* Alaska, Alberta, Alford and Arlis. At Cedar Grove the only types that use *these patterns* are Foster Trailed-Incised and, much less frequently, Karnack Brushed-Incised.

Category 5 consists of 638 trailed sherds. About 95% of these must be Foster Trailed-Incised body sherds. Unfortunately, we cannot classify them as such because, as we have already noted, the troublesome Fish Bayou variety of Karnack Brushed-Incised also uses trailed body designs.

Category 6 consists of four fingernail-punctated sherds, two shell-tempered and two grog-tempered.

Category 7 consists of nine grog-tempered sherds, all probably from the same vessel. This seems to have been a high rimmed jar with a punctated rim (Agnes pattern) and a vertically oriented incised herringbone design of an unrecorded pattern on the body (Figure 11-51a). This vessel might belong to a very late unrecorded variety of Foster Trailed-incised—something similar to var. Shaw with its punctated rim and incised body. On the other hand, Emory Punctated (Story 1967:136-139) might be a more appropriate

Table 11-10. Undecorated sherds, not classifiable to type or variety

Temper	Sherds	Bases	Rims	Fine Ware Neck Rims	Plain Bowl	Red Slipped Sherds	Red Slipped Rims	Coarse Ware Sherds	Coarse Ware Rims
Shell			3		2		1	1112	66
Grog			13	1	2	1	1	13	1
Bone			1			1			8
Not visible			58	6	1	13	2	6	4
Temper not checked	2739	25							
Total	2739	25	75	7	5	15	4	1131	79

classification on the grounds that rectilinear body designs should be considered outside the range of Foster Trailed-Incised. We would be more positive about the Emory Punctated identification if this vessel were shell tempered instead of grog tempered.

Category 8 consists of two thick grog-tempered sherds of unknown type (Figure 11-51b).

Category 9 consists of one shell-tempered zoned crosshatched incised sherd of unknown type (Figure 11-51c).

UNDECORATED SHERDS

Although undecorated sherds constitute 53.17% of the sortable sherd collection, (4,080 sherds, total; Table 11-10) it is clear that the majority of them must be from undecorated parts of vessels of the decorated types already identified. The best evidence for this is the scarcity of plain rims, particularly large plain rims that would indicate either completely plain types or plain rimmed types within either the fine wares or the coarse wares.

Undecorated Fine Ware

Undecorated fine ware sherds constitute 37.40% of the sortable sherd collection, or 2,870 specimens (Table 11-10). The majority of these, 2,739 sherds lack landmarks that would indicate what parts of the vessel they are from. Most must be body and base sherds from vessels of the common decorated (but plain bodied) bowl types or varieties at Cedar Grove like Belcher Engraved and Hodges Engraved var. Armour. The small number of plain rims (75), plus the small size of most of these, eliminates the possibility of a significant number of plain fine ware vessels of any type in this collection. Eleven of the 75 rim sherds have very small projected diameters and flared lips, attributes that suggest they are from plain spouted bottles of the types Belcher Engraved or Hodges Engraved. Other small sherds in this group of 75 are probably also from bottle necks and spouts. The five rim-body sherds from plain bowls (Table 11-10) are all from miniature vessels, perhaps similar to the small undecorated effigy bowl, Vessel 1, from Burial 1 (Figure 11-12). One of these fragments has attachment scars, probably from rim and tail adornos similar to those on Vessel 1.

Undecorated Coarse Ware

Undecorated coarse ware sherds, of which there are 1,210 (Table 11-10), constitute 15.37% of the sortable collection and 29.66% of the undecorated sherds. These low figures are to be expected in a collection wherein the main decorated coarse ware types are those with decorations covering most or all of the vessel rims and bodies. Most of these sherds are probably from the lower bodies and bases of vessels of the types Karnack Brushed-Incised, Belcher Ridged and Foster Trailed-Incised. The fact that 97.35% of this collection is shell tempered eliminates the possibility (remote anyway, because of other factors) of a significant amount of early plain pottery, such as Williams Plain or Le Flore Plain being hidden among the undecorated coarse ware.

There are only 79 rims in this category, as opposed to 1,131 body or base sherds, and all the rim sherds are very small. These probably came from Foster Trailed-Incised vessels with rim designs such as Agnes 2, Alfred 1, and Alfred 2 and Alfred 6 (Figure 11-1), which have small undecorated zones just below the lip.

ANALYSES

In this section, we draw on data organized and presented in preceding sections to define and discuss the temporal and cultural contexts of the Cedar Grove ceramic collections and to identify and refine the cultural units that they represent.

Temporal Analysis

How many occupations? In Table 11-11 we compare by type and percentage of occurrence the three collections of ceramics from Cedar Grove: namely the sherd collection from the June 1980 tests (Schambach et al. 1982, Table 5) and the sherd collection and the mortuary collection from the Fall 1980 excavations. The range of types represented in all three collections is both practically identical and limited mainly to the Caddo IV and Caddo V periods. Clearly these collections all represent the same occupation or sequence of occupations within a Caddo IV to Caddo V time range.

Table 11-11. Comparison of the three major pottery collections from Cedar Grove

Type or Category	June 1980 Test Collections #	June 1980 Test Collections %	Fall 1980 Excavation: Sortable Sherd Collection #	Sortable Sherd Collection %	Mortuary Collection #	Mortuary Collection %
Avery Engraved	1	.08	9	.12	2	2.98
Belcher Engraved	17	1.37	80	1.04	12	17.91
Cabaness Engraved					2	2.98
Glassell Engraved	4	.32	1	.01	1	1.49
Hodges Engraved	3	.24	72	.94	11	16.41
Keno Trailed	50	4.03	346	4.51	6	8.95
Natchitoches Engraved	15	1.21	89	1.16	3	4.47
Hodges/Natchitoches/Belcher bottles	52	4.01	205	2.67		
Belcher Ridged	49	4.00	325	4.23	1	1.49
Cass Appliqued	1	.08				
Cowhide Stamped	2	.08				
Foster Trailed-Incised	247	19.90	501	6.53	15	22.38
Karnack Brushed-Incised			8	.10	6	8.95
Untyped fine--decorated and plain	399	32.15	3364	43.83	8	11.94
Untyped coarse--decorated and plain	392	31.59	2643	34.44		
Total	1241		7674		67	

The four discrepancies in the range of types represented are not serious and are easy to explain. Two types, Cass Appliqued and Cowhide Stamped are weakly represented in the June 1980 test collection (by one sherd of Cass Appliqued and two of Cowhide Stamped) and then do not reappear. Cass Appliqued is supposed to have a Caddo IV/V time range, but its center of distribution seems to be East Texas. It is normal to find it weakly represented at Cedar Grove. We attach no particular significance to finding a sherd or two of it in one collection but not the others. Cowhide Stamped is present at four other sites in the Spirit Lake and Boyd Hill localities, Foster (e.g., Moore 1912:Figure 112, vessel 17), Handy, Battle, and Lester (Arkansas Archeological Survey photo file). But, to judge from this distribution and its stratigraphic position at the Belcher Mound, (Webb 1959:145, Figure 124) it is an early to middle Caddo IV period type. We would not expect to find more than a sherd or two of it in an assemblage that presumably falls in a late Caddo IV to early Caddo V time range.

The absence of the new type Cabaness Engraved in sherd form in either collection does not disturb us. This type is obviously rare to begin with. And it is bound to be difficult to recognize in sherd form because of its similarity to Hodges Engraved and Natchitoches Engraved.

Karnack Brushed-Incised was not identified in the June 1980 sherd collection (though, as we note earlier, we suspected it was present) because this type cannot be distinguished from Foster Trailed-Incised in sherd form unless rim-body sherds are found. There were none in that collection.

The several large quantitative differences between the mortuary vessel collections and the sherd collections are also easily explained, mostly in terms of the sortability in sherd form of the types involved. The figure of 12 vessels of Belcher Engraved is way out of proportion with the frequency of this type in sherd collections. Assuming this type is not a special mortuary ware, which we do not think is the case, it ought to be at least as well represented in sherd form as Keno Trailed or Foster Trailed-Incised. The problem here is that sherds of Belcher Engraved bowls (nine of these twelve vessels are bowls) cannot be sorted from sherds of Natchotoches Engraved var. Lester Bend bowls unless you have sherds showing portions of both the rim and the body since these types share rim designs of the Central pattern. As we point out in the description of the untypable decorated fine ware sherds, there are 140 untypable rims of the Central pattern. Many are certainly from Belcher Engraved bowls, more than enough, we are sure, to balance out the discrepancy between the sherd count and the whole vessel count.

Similarly, Karnack Brushed-Incised is underrepresented in sherd form because of the problem of sorting Karnack sherds from Foster Trailed-Incised body sherds. Foster can be positively identified in sherd form from rims, Karnack cannot.

Hodges Engraved also seems badly underrepresented in sherd form, since there are eleven vessels and only 72 sherds. This is expectable considering what varieties are present and what kind of showing they are apt to make in sherd form. The main varieties are Armour and Sentell, accounting for six of the eleven whole vessels. Both are plain bodied bowl varieties with only narrow bands of rim decoration, a combination that guarantees a poor showing in the sherd collections.

On the other hand, Belcher Ridged seems to be badly under-represented in the mortuary collection. This is mostly because this type is so easy to recognize in sherd form. The distinctive ridging makes it a type that you can sort with your eyes closed, and from the smallest sherds. This, plus the fact that the ridged decoration usually covers the entire bodies of large, small rimmed, coarse ware jars means that it will be overrepresented in sherd collections, relative to just about any other type. There is also the possibility that some of the--we would think--earlier incomplete grave lots contained some Belcher Ridged jars originally. And, there is the possibility that this type lost popularity as a grave offering faster than it did as a type for every day use.

Approximate period of occupation. Using various lines of ceramic evidence we can bracket the occupation of Cedar Grove in the interval beginning with the last quarter of the Caddo IV period and ending at the middle of the Caddo V period (A.D. 1650-1750).

First, the types and varieties present all have reasonably well documented known time ranges (pointed out in the type descriptions) either within or extending into this interval.

Second, the possibility of occupation before Middle Caddo IV times is precluded by the scarcity or absence of all important Caddo III and Early to Middle Caddo IV marker types. Some of the significant absentees here (all of them well represented at other sites in the Spirit Lake locality) are: Handy Engraved, Haley Engraved, Bossier Brushed, Pease Brushed Incised, Sinner Linear Punctated, Haley Complicated Incised, and Washington Stamped.

Third, the scarcity, either in sherd or vessel form, of a few types that seem to have peaked in popularity early in Webb's sequence at the Belcher site and were going into decline by the end of it, (Webb 1959:145, 149, Figure 124) suggests that occupation began in the last quarter of the Caddo IV period. In this respect, the most significant types are Cowhide Stamped and Glassell Engraved, both very strong at Belcher, but evidently on the way out at Cedar Grove. The scarcity of Belcher Ridged in the mortuary collection may be significant here also.

Fourth, we take the high percentage of shell temper throughout the sherd collections and the mortuary collections (86% in the coarse ware sherds, 95% in the coarse ware vessels, 9.91% in the fine ware sherds, and 45% in the fine ware vessels) as a strong indication that the entire Cedar Grove occupation is late. Shell temper was evidently a migratory mode that moved gradually across the Caddo area in a westerly to northwesterly path from a Lower Valley "center" somewhere in southeast Arkansas or northeast Louisiana. It tended to affect all types once it reached a region, starting with the coarse wares. In the Great Bend region it is present in about 20% of the coarse wares in the (Early to Middle Caddo IV) Belcher phase assemblage at the Belcher site (Webb 1959:154; Schambach et al. 1982:145). Extrapolating from that figure and assuming a steady increase, we would have to place the Cedar Grove assemblage later than the Belcher assemblage. This would seem to be late Caddo IV, at the earliest, but mainly Caddo V--unless it took shell temper 50 years or so to come up the Red River from the Belcher site to Cedar Grove, and we doubt that.

Fifth, Keno Trailed and Natchitoches Engraved both indicate a late Caddo IV to Caddo V placement with the latter being considered exclusively a Caddo V type. On the other hand, the relative popularity of what we take to be the earlier Lester Bend variety of Natchitoches Engraved over what we take to be the later Natchitoches variety suggests an occupation ending sometime around or just before the middle of the Caddo V period. So does the popularity of Belcher Engraved var. Owen, which we take to be the immediate ancestor of Natchitoches Engraved (Figure 11-11). And so does the presence of the Shaw variety of Foster Trailed-Incised, which we consider ancestral to the late Caddo V type Emory Punctated and the middle eighteenth century Lower Mississippi Valley type Winterville Incised var. Tunica (Figure 11-10).

Phase Unit Analysis

In terms of a standard phase-unit analysis of Caddo pottery types and varieties, the Cedar Grove collection contains pottery belonging to two phases: Webb's Belcher phase (Webb 1959) and our new Chakanina phase. The Chakanina phase is based on our analysis of the ceramics from the June 1980 testing at Cedar Grove, plus some

comparative studies. Although most of the pottery was obviously Belcher phase, a new phase was called for by the presence of the Caddo V period (and Glendora horizon) marker type Natchitoches Engraved, the high percentage of the Caddo IV to Caddo V period type Keno Trailed--also a Glendora horizon marker--and the high frequency of shell temper. We assumed, pending further work, that Cedar Grove was a single component site, with the other types in the assemblage, those shared by Belcher and Chakanina phases, indicating the evolution of the Chakanina phase out of the Belcher phase.

Such assumptions are commonly made by archeologists working within regions (and within a cultural-evolutionary framework). In our case it was supported by enough knowledge of the region that we did not seriously expect to find a Caddo V unit that did not show strong evidence of Belcher phase carryovers. Thus we are not surprised to see that the sherd collections and the mortuary collections are in nearly complete correspondence both with each other and with the test excavation collections, and therefore confirm the Chakanina phase as we roughed it out originally.

Now we want to see if it can be refined, and more clearly distinguished from the Belcher phase, by taking a closer *look at the contextual* data assembled in this report. The answer is that it can. The data we want to look at are mainly the grave lot data from the mortuary collections. There is, unfortunately, little more to be gotten from the sherd collection on this score. Most of the sherds that did not come from widely scattered locations and unknown or uncertain cultural contexts, came from the rich, but completely secondary contexts of the levee muck ditches.

With the grave lots, however, we have not only the contextual data to work with but also the finer ceramic units offered by twenty-three new varieties. We will proceed here by first seriating the grave lots and grouping

Table 11-12. A seriation of the mortuary pottery from the Cedar Grove site

	Type	Foster Trailed-Incised								Belcher Engraved			Natchitoches Engraved		Keno Trailed					Hodges Engraved				Karnack Brushed Incised				Avery Engraved		Glassell Engraved	Belcher Ridged	Calmess Engraved	Untyped					
	Variety	var. Foster	var. Dobson	var. Red Lake	var. undeterminable	var. Dixon	var. Moore	var. Finley	var. Shaw	var. Belcher	var. Ogden	var. Owen	var. Lester Bend	var. unknown	var. undeterminable	var. McClendon	var. Phillips	var. Glendora	var. Scott's Lake	var. Sentell	var. Kelly's Lake	var. Armour	var. Candler	var. Karnack	var. Fish Bayou	var. unknown	var. undeterminable	var. Graves	var. unknown	var. McGee	var. undeterminable	var. unspecified	Bird effigy bowl	Incised bowl	Engraved jar	Engraved bowl	Plain bottles	Total
	Group 3																																					
	Burial #10					1	1	1	1			2	1	1									1														1	10
	* Burial # 4								1													3	1						1									6
	Burial # 9					1	2												1	1	1		1									2				2		11
Late	* Burial # 5				1							1	1				1	1																				5
	Burial # 7				1							1															1				1						1	5
	* Burial # 3																1																				1	2
	* Burial # 1 & 2																			1						1							1	1	1			5
	Group 2																																					
	Burial #15															1								1														2
	* Burial #11		1	1											1								1		1													3
	* Burial #12		1									1										1		1						1								5
	Group 1																																					
Early	* Burial #14	1								1	1													1				1										5
	Burial # 8	1								1	2																											6
	* Grave lot incomplete																																					67

them into components. These we will then crosscorrelate with grave lot and house floor based units and components at the Belcher site and elsewhere to make our phase identifications.

Seriation of the grave lots and burial groups. According to the known or suspected time ranges of the types and varieties at Cedar Grove, the two earliest grave lots are numbers 6 and 11 from Burials 8 and 14 in what we therefore call the Ceramic Group 1 burials (Table 11-12). These lots contain only recognized Belcher phase types and they contain more of them than other lots. Both lack the post-Belcher phase, Caddo IV/V or Caddo V period marker types Keno Trailed and Natchitoches Engraved that are fairly well represented in other grave lots. On the other hand they contain the only examples in the mortuary collection of Belcher Engraved var. Ogden bottles, Belcher Engraved var. Belcher bowls, Foster Trailed-Incised var. Foster jars and the only Avery Engraved var. Graves bowl. And, of course, they are consistent with each other. (Lot 11 from Burial 14 is probably incomplete. There is no way of telling how much that may have changed things.)

Turning now to the upper end of the time scale, the latest grave lot is, we think, number 8 from Burial 10. It is so placed because it contains two Natchitoches Engraved vessels--a recognized Caddo V type--and, equally significant in our view, one vessel of the Shaw variety of Foster Trailed-Incised. The latter, we are convinced, is an extremely late variety of Foster Trailed-Incised. As we argue in the variety description, it probably dates to the period 1700 to 1730, to judge from its resemblance to the middle eighteenth century types Emory Punctated and Winterville Incised var. Tunica.

Our seriation of the burials between Burial 14 of Group 1 and Burial 10 of Ceramic Group 3 is based primarily on our technical and stylistic seriation of the varieties of Foster Trailed-Incised (discussed in the type description; see Figure 11-10) and secondarily on our seriation of the apparently homologous Belcher, Owen, Lester Bend, and Natchitoches varieties of the types Belcher Engraved and Natchitoches Engraved (Figure 11-11). The three grave lots (numbers 12, 1, and 2) lacking both of these types were seriated on the basis of various ad hoc judgments--not quite sheer guesses--about the stylistic similarities and temporal priorities of different varieties or designs within other types. Grave Lot 12 (Burial 15) seemed to fit best in Ceramic Group 2 because the McClendon variety of Keno Trailed suggests it might be too late for Ceramic Group 1, yet a little too early for Ceramic Group 3. Also the Karnack var. Karnack jar suggests a close relationship with Burials 12 and 14.

Grave Lot 1 (Burial 1-2) was put early in Ceramic Group 3 rather than in Ceramic Group 2 because the deep bodied bowl form of Hodges Engraved var. Sentell strikes us as a late development in Caddo ceramic. We would have put this grave later in Ceramic Group 3--with Burial 9, which also had a var. Sentell bowl--had it not also contained a Karnack vessel. That type tends to cluster in Ceramic Groups 1 and 2 at this site. We also made a small allowance for the fact that all five vessels in this lot are shell tempered.

Grave Lot 2 (Burial 3) was put in Ceramic Group 3 because of the Keno Trailed var. Phillips beaker. This dictated a placement similar to that of Grave Lot 4 (Burial 5) which also contained a var. Phillips beaker.

One might well question our assumption--since it is just that--that all twelve grave lots can be seriated. Some of them might, in fact, be contemporaneous or so nearly so that seriating them--particularly the incomplete ones--is arbitrary, if not pointless and misleading. That is one reason we have divided them into three groups. We believe that we have the groups in the right order. The chronological evidence we present on the various types and varieties seems sufficient for that. We are also fairly certain that the first few grave lots in the large Ceramic Group 3 are earlier than the last one or two. Beyond that, we admit there is a strong possibility of contemporaneity within each group.

But now that we have issued this disclaimer to shelter ourselves from criticism on an obvious point, we would like to go a bit further and raise a point that may not be so obvious. That is that the time intervals we believe we are operating within here are much shorter than what most archeologists are accustomed to. We think that with this assemblage and the fine units of ceramic analysis that we are using, we have gone from what we might call a normal time scale with macrounits of 100 to 200 years duration and microunits of something on the order of 30 to 50 years duration to a much finer scale. Here, we think, we are operating on a scale with macrounits of 20 years duration and microunits of five years or so. Figuratively speaking, it is as if we have gone from hours to minutes. So what would normally be considered contemporaneous, since it falls within the same hour, can, in fact, be seriated in terms of minutes, if there is enough temporally significant ceramic variation at this level to work with. We propose that there is, that our seriations of Foster Trailed-Incised, Belcher Engraved and Natchitoches Engraved reflect small changes that occurred within years of each other rather than within decades or half centuries. This is a testable hypothesis. We consider it a most interesting one because it ties in with and tends to support the major premise of our new ceramic classification. That is that the majority of the small variations that show up as apparently meaningless static in the type variety system (a macroscale system) are worth recording because they are meaningful on a microscale.

Component A: Cedar Grove II
The Belcher Phase

The grave lots in Ceramic Groups 1 and 2 are Belcher phase. We combine them into one component labeled Cedar Grove II. With the exception of Foster Trailed-Incised, Keno Trailed, and Avery Engraved, the types in these two burial groups are all major Belcher phase types: namely Belcher Engraved, Hodges Engraved, Glassell Engraved, and Karnack Brushed Incised (Webb 1959:192). While Foster Trailed-Incised, Keno Trailed, and Avery Engraved are less well represented than these four at the Belcher site, and on that basis only are not considered "major" Belcher phase types, they are all recognized companion types in Belcher assemblages. They are not out of place here. The only important Belcher phase type that is missing from the grave lots is Belcher Ridged, but it is well represented in the sherd collection, as we have noted, and its absence from the grave lots is most economically explained by the fact that three of the five Ceramic Group 1 and Ceramic Group 2 grave lots are possibly incomplete. Grave Lots 9 and 10 from Burials 11 and 12 are almost certainly so since both graves were about half cut away by historic graves in the nineteenth to early twentieth century Cedar Grove cemetery. Time may be a factor here too, as we have noted.

Also missing, perhaps also due to time, is the numerically much less important and not exclusively Belcher phase type, Cowhide Stamped. As we have noted, it seems to have been at the peak of its popularity in the Belcher III component at Belcher and on its way out in the Belcher IV component. Considering this apparent trend and the very weak representation of Cowhide Stamped in the midden at Cedar Grove, we are inclined to consider it a type that had vanished from the assemblage before the Cedar Grove II graves were dug. On the other hand, we do not know what else was in the incomplete grave lots and Webb (1959:153) does note that Cowhide Stamped seems to behave like a special mortuary type at Belcher rather than like a "domestic" type such as Belcher Ridged. That is to say, it shows up in vessel form in rich graves, but is only infrequently found in sherd form. So this is one loose end we cannot eliminate.

Shifting from types to varieties and modes, we find two significant differences in occurrence or frequency of occurrence in these finer units of analysis between the

Cedar Grove II component and the *Belcher phase* (Belcher IV) assemblage at the Belcher Mound. Again time, not space, seems to be the controlling variable, with everything adding up to a later placement for Cedar Grove II. Primary here is the incidence of shell temper. We have already discussed both its distribution in the collection as a whole and the presumed temporal significance of the fact that about 95% of the coarse ware and at least 45%, probably more, of the fine ware is shell tempered. Now, on closer analysis, and with the seriation of our grave lots and burial groups accomplished, the Ceramic Group 1 and 2 grave lots seem to tell us that shell temper had almost completed its invasion of the Cedar Grove assemblage by the time the typologically earliest grave lots were interred. Thus, in Group 1 alone shell temper is present in two of the six vessels in Lot 6, Burial 8 (V1, Foster Trailed-Incised jar and V3, Belcher Engraved var. Belcher bowl) and in four of the five vessels in Lot 11, Burial 14 (V1, Avery Engraved var. Graves, V˜, Karnack Brushed Incised var. Karnack, V3, Belcher Engraved var. Ogden, and V4, Foster Trailed Incised var. Foster). The question this leaves us with is, how long did it take t- go from 20% shell to perhaps 80% shell? We do not know. The spread of shell temper could have been fast or slow. If the existing C-14 dates and the current chronological placement of the Belcher III and IV components in the A.D. 1600 to 1650 range are correct, (Webb 1959:207) then it was fast. If not, Belcher III and IV must be earlier than we think because we cannot move Cedar Grove II any further up the time scale. We are crowding the full historic period as it is.

Second, we note the lack of Belcher Engraved var. Soda Lake in the Cedar Grove II graves and its weak representation in the sherd collection. This is a major variety in the Belcher III and IV assemblages at the Belcher Mound and also at many recognized Caddo IV (or earlier) sites in the Spirit Lake and Boyd Hill localities (Lester, Battle, Handy, Friday, Foster, and Cryer). Apparently the Cedar Grove II component is a little too late for this variety. Here it seems to have already been replaced by Belcher Engraved var. Ogden bottles.

Component B, Cedar Grove III
The Chakanina Phase

The line we have drawn (Table 11-12) between the Ceramic Group 2 and Ceramic Group 3 grave lots is placed where it is because at that point Table 11-12 shows a series of changes at the varietal level that ad' up to an almost complete discontinuity. Only the Owen variety of Belcher Engraved and the Armour and Candler varieties of Hodges Engraved "cross" this line. This discontinuity indicates a time gap, probably one brief enough to be filled by a few grave lots re,resenting about twenty years of varietal level changes. Al'o, it reflects fairly well the spatial clustering of the burials. Since we scrupulously avoided considering the distribution of the burials when we did our seriation, this tends to validate not only our seriation but also our varieties. This also makes a convenient place to draw what would otherwise have to be an arbitrarily placed line between the Belcher component and the Chakanina component, (assuming as we do that in a complete seriation sequence there would be no discontinuities like the one we see here, because the Chakanina phase evolved out of the Belcher phase).

The Ceramic Group 3 assemblage conforms to and confirms the Chakanina phase ceramic assemblage essentially as we defined it in our preliminary report.

> Its diagnostic . . . types are the panregional marker types of the Caddo V period, Natchitoches Engraved and Keno Trailed Incised. The core . . . types in the Chakanina assemblages are shared with the preceding Belcher phase: Belcher Engraved, Belcher Ridged, Foster Trailed-Incised, and Hodges Engraved. The coarse ware types Foster Trailed-Incised and Belcher Ridged are at least 50% shell tempered and may be 90 to 100% shell tempered in very late assemblages. This is an increase from less than 20% shell tempered in Belcher phase assemblages. Other pottery types are Cass Appliqued, Glassell Engraved, and Webb's (1959:142-143) eastern variety of Avery Engraved (Schambach et al. 1982:145).

To this assemblage we now add Karnack Brushed Incised, as another Belcher phase carryover. And we add the new type Cabaness Engraved. We drop Cass Appliqued and Glassell Engraved because of their poor showing in the sherd collections and their failure to appear in any of the Ceramic Group 3 burials. We are now very suspicious of Belcher Ridged and are on the verge of dropping it from this phase, even as a minor Belcher phase carryover. We think the recycled fragments of a Belcher Ridged jar from Burial 7 came from an earlier trash deposit.

The new varietal level data from Cedar Grove permits us to fine focus this still blurred image of the Chakanina assemblage. The major utility type is obviously Foster Trailed-Incised, but the Dixon, Moore, Finley, and Shaw varieties appear to be solid Chakanina phase diagnostics, whereas the Foster and Dobson varieties are probably exclusively Belcher phase. (The distinctive punctated rims of the Moore and Shaw varieties and the even more distinctive incised rather than trailed body decoration of the Shaw variety make them superb marker types for work with sherd collections. It will now be much easier to identify Chakanina components in the field.) We can now see that Belcher Engraved only carries over into this phase in the Owen variety. Belcher var. Ogden bottles probably do not carry over at all. The bottles of this phase appear to be exclusively of the types Keno Trailed and Hodges Engraved. The new Keno Trailed varieties Phillips, Glendora, and Scott's Lake all promise to be Chakanina phase markers within the Great Bend region. Glendora is also obviously a good panregional marker for the Caddo V period. Although only the Lester Bend variety of Natchitoches Engraved is represented among the whole vessels of the mortuary collection, we include both it and the classic Natchitoches variety in the Chakanina assemblage since it is present in sherd form (see Table 11-4 and Figure 11-16).

Dating and Phase Placement of Caddo Structure 1

We are now in a position to offer a ceramic date and a phase placement for the only reasonably complete posthole pattern of a structure found at the site, the so-called Feature 3 or Caddo Structure 1. Burial 15 intruded the floor of this structure. Thus it should not be later than our Ceramic Group 2 burials (Table 11-12). We suspect, from various bits and pieces of evidence that it may have been customary to bury children under 10 years old or so inside houses that were still in use, or only recently abandoned. If so, and that would seem to be the case here, Structure 1 and Burial 15 would be about the same age. Strong supporting evidence for this comes from Feature 17, a trash filled pit also located inside Caddo Structure 1 and presumably contemporaneous with it.

From Feature 17 we have classifiable sherds of the following types and varieties: one Foster Trailed-Incised rim, either var. Foster or var. Red Lake; three sherds of Belcher Engraved bowls, var. Belcher or var. Owen; one sherd of either Belcher Engraved (var. Belcher or Owen), or Natchitoches Engraved var. Lester Bend; one sherd of Hodges Engraved var. Armour; one sherd of a Hodges Engraved bottle, variety undeterminable; one sherd of Avery Engraved var. Bradshaw and four body sherds of Belcher Ridged. (Untypable pottery from this feature consists of seven sherds of plain fine ware; nine sherds of plain coarse ware; three sherds of trailed-incised coarse ware, two simple brushed sherds, three simple incised sherds, two compound incised coarse ware sherds, one sherd of crosshatched fine ware and one "Class 14" miscellaneous

fine ware sherd. The remainder of the collection of 166 sherds from Feature 17 consisted of unsortable crumbs.)

The Feature 17 assemblage is, with the single exception of the possible Natchitoches Engraved variety Lester Bend sherd, quite consistent with our Ceramic Groups 1 and 2 assemblages. All things considered, it more closely resembles the Ceramic Group 2 assemblage. Thus Caddo Structure 1 appears to be a late Belcher phase, Cedar Grove II, structure with a ceramic age of A.D. 1670 to 1700.

CONCLUSIONS

In our preliminary report on Cedar Grove we described the sherd collection from the test excavations as "a very tight ceramic assemblage indicating occupation by a single cultural group over a short time span, probably less than 100 years." We suggested that this occupation was by a Caddo V group whose remains we assigned to a new phase that we called the Chakanina phase. We argued that this group was the Kadohadacho and we predicted that the Chakanina phase would date to the eighteenth century (Schambach et al. 1982).

We also argued that the Cedar Grove site was one of a large group of contemporaneous Caddo V period farmstead sites in the "Spirit Lake locality." We suggested that this group of sites, which we referred to as the "Spirit lake complex," was the remains of a single Kadohadacho village, possibly the Kadohadacho 2 village observed by the Freeman-Custis expedition.

Our present study either confirms or corroborates all of these observations and arguments on the cultural and temporal placement of Cedar Grove. The latest occupation was by a Chakanina phase group. Now, however, we can see that that occupation was begun late in Caddo IV times by people with a pure Belcher phase ceramic assemblage. By middle Caddo V time this assemblage had been transformed into a Chakanina phase assemblage through stylistic and technological evolution within some of the basic Belcher phase types. We see no evidence of significant outside influence on this process, meaning influence from outside the Great Bend region. Judging as closely as we can from the chronometric and associational data available for the major pottery types and varieties in the Belcher phase and Chakanina phase assemblages, we would say that occupation began around A.D. 1670 and ended around 1730. Our looser and much safer outside estimate would be A.D. 1650 to 1750. The occupation was very probably continuous, in our opinion. The *discontinuity* that we see in our ceramic group seriation probably marks, not a gap in occupation, but a missing burial cluster, similar to but slightly earlier than the one represented by our Burial Group 3. That cluster is probably situated in the unexcavated area near Caddo Structure 1.

What type of compound in the Caddo settlement system does the Cedar Grove ceramic collection represent? Are these the ceramics of a typical Caddo farmstead of the period A.D. 1650 to 1750 or is this site something special? Can we generalize from it to other sites in the Spirit Lake locality; to other sites in the Great Bend region; to other sites in the Central Caddo area?

So far as the range of pottery types and varieties present is concerned, Cedar Grove seems to be typical of all the sites in the Spirit Lake complex (Schambach et al. 1982:109). We cannot prove that all the graves from all the compounds in this complex were as richly furnished with pottery as those at Cedar Grove, but it seems that they were. The few scraps of data provided by C. B. Moore and others (Moore 1912, Hemmings 1982) suggest this is so, as does the sheer number of extremely good specimens in the Lemley collection from "Lester Bend" (Schambach et al. 1982:109, Table 6-1).

But this does not necessarily mean that we have finally excavated an average late Caddo farmstead, something that *we might consider typical in all respects of those that must* have existed throughout the Great Bend region, and elsewhere in the Central Caddo area at this time. Before we begin patting ourselves on the back for that, we must *take a closer look at the "Spirit lake complex," and* consider some possibilities as to what it might have been.

We defined this "complex" in our preliminary report as the remains of a single late village consisting of scattered farmsteads and other types of compounds that extended from slightly north of Garland City south to Lester Bend. Specifically:

> The northernmost compounds in this village may have been at the Friday site (now destroyed by the Red River) where Moore found Keno Trailed vessels (1912:Figure 80). There were definitely several compounds on the adjoining C. M. Shaw and Joe Russell properties at Garland City, where many late vessels have been found, including the types Natchitoches Engraved and Keno Trailed. There was at least one compound in the vicinity of the Spirit Lake site (3LA83; now destroyed) that produced Natchitoches Engraved bowls and bottles (Hemmings 1982:Figure 5-11). There were probably some compounds near Spirit Lake itself since several late vessels in the Lemley collection are attributed to that location. The two low refuse mounds that Moore dug at the McClure place (both now destroyed by the Red River) produced Keno Trailed pottery (Moore 1912:577-681) and were probably part of this complex. So too, was the "low rise" near the Battle Mound where Moore (1912:566-573) stumbled on five graves with pottery that is uncharacteristically late for the Battle site, including, again, Keno Trailed and a possible variant of Natchitoches Engraved (see Moore 1912: Figures 61, 62, 63, and 64). There are six late vessels in the Lemley collection from a site somewhere on the Rube Russell property, located between Battle Mound and the Red River, which must have been yet another compound in the Spirit Lake complex.
>
> Finally there is a collection of 118 whole vessels in the Lemley collection from the old Sentell and Lester Brothers plantations (3LA38) on Lester Bend itself (Table 6-1). This pottery was reportedly collected from the riverbanks as graves washed out on both sides of the river. Considering the collection technique, the vessels in the Lemley collection must represent a parent population of many hundreds and it seems clear that there was a major concentration of compounds around Lester Bend. Our Cedar Grove ceramic collection matches the Lemley collection practically *type for type, demonstrating that the Cedar Grove site* was part of the concentration of Spirit Lake complex sites at Lester Bend (Schambach et al. 1982:109).

We argued then that the Spirit Lake complex was the remains of the Kadohadacho 2 village observed in ruins by the Freeman-Custis expedition. We see no reason to change that interpretation or to alter our opinion that the Cedar Grove site was one compound, most probably a farmstead, in that village.

Since then, however, it has occurred to us that we really have not given adequate consideration to the various possible relationships of this village to all the mounds and mound groups in the Spirit Lake locality.

These include the Friday mound group on the north end of the locality, the great Battle Mound near the center and the Egypt mound group on the south end (Moore 1912). These have always been considered separate and temporally unrelated sites with small precincts. Perhaps they were, but we do not know this. We have simply followed C. B. Moore in seeing them this way. Thus we thought of the Spirit Lake complex as a dispersed village surrounding and related to the great Battle Mound or perhaps the Egypt site. Actually, there is no reason to believe it could not have been the other way around in the emic Caddoan scheme of things. The whole Spirit Lake complex or major parts of it, including Cedar Grove, might have been within

the ceremonial precincts of Battle Mound, or the even closer Egypt mound group. Or, all the mounds from Friday south to Egypt, plus the "village" might have constituted a single great dispersed ceremonial zone rather than a Lower Mississippi Valley style ceremonial center with a village surrounding it.

And so we will suggest, for the sake of argument, that this could be the case here. This would account for the richness of the Spirit Lake complex burials. This, we strongly suspect, is not typical of burials at all farmsteads of this period in the Central Caddo area, but only of those of members of a special group, such as a paramount lineage.

Swanton's comments on the meaning and derivation of the term Kadohadacho are of interest here.

> Just as the Hainai were sometimes regarded as the Hasinai tribe par excellence, so in the confederacy on Red River were the Kadohadacho eminent above all the rest. The name is derived from Kadi, or rather Kaadi, Ka'-edi, meaning "chief," and Kadohadacho signified "real chiefs." Strictly, it was applied to one of a group of four bands...(1942:5-6)

We do not know what this particular "band" was or where it resided, other than that it was somewhere in the Great Bend region. Whatever it was we can be sure that it was something more complex than a "band." It may well have been a lineage group and the term "chief," which is surely a loose translation, may well indicate a paramount lineage. If so, we think its most likely place of residence would have been in the Spirit Lake locality, in the vicinity of Battle Mound, which is, after all, the paramount Caddo ceremonial center, no matter what the actual size of its ceremonial precincts.

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Chapter 12

PIGMENTS ANALYSIS OF PAINTED CERAMICS AND WITHIN GRAVE OFFERINGS ON A LATE CADDO SITE AT CEDAR GROVE, ARKANSAS

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Elizabeth A. Coughlin

INTRODUCTION

Pigments on painted artifacts are used as indicators of European contact (Brain, personal communication). This study identifies a number of pigments on painted, incised ceramics and grave offerings from a Caddoan site at Cedar Grove, Arkansas.

Before contact, pigments were indigenous materials as postfiring paints: whites (calcite, white clay, gypsum), reds (hematite, vermilion) and greens (malachite) as discussed by Shepard (1954:48; cf. Table 12-1). Shepard (1954:177) mentions that there were a number of natural pigments that were used in the Old World but did not appear in the New World, such as white lead (natural lead carbonate), red lead, rose madder, chrysocolla (green), and terre verte (green) (Table 12-1).

New pigments became important trade goods after European contact. For example, the French supplied vermilion to the southeastern Indians (Gregory 1973). Schambach (personal communication) suggests that white lead was also traded at this time. Table 12-2 describes pigments that were in use in Europe at the time of contact (A.D. 1650-1750). Although vermilion does occur naturally in North America, it would be interesting to know the extent of its distribution before contact. It was used in California (Ross 1940; Heizer and Treganza 1944). It also occurred in Texas (Hillebrand and Schaller 1909) and other areas of the United States (Groton 1941; Ebner 1954).

Two late Caddo V sites in the Sabine River Valley yielded vermilion offerings in graves. These sites contain the pottery type, Natchitoches Engraved, which is found in abundance in the midden and burials at Cedar Grove. It is reasonable to assume that European pigments were traded and used in the decoration of Cedar Grove ceramics. Therefore, the analysis of the pigments could be used to resolve whether these pigments were indigenous or had European origin (Table 12-2).

Pigments were found painted on incised ceramics. Red and white pigments were rubbed into the engraved lines. It is also possible that natural binders were used to adhere the pigments to these surfaces. Pigments were also found in the soil within shell grave offerings within the Caddo cemetery. Table 12-3 lists the samples that were submitted for analysis to the Harvard Center for Archaeological Research and Development.

Table 12-1. Indigenous pigments (A) used as post-firing paints for ceramics (Shepard 1954:43); (B) not used (Shepard 1954:177)

A. Color	Material	Composition
White	Calcite	
	White clay (Kaolinite)	$Al_4Si_4O_{10}(OH)_8$
	Gypsum	$CaSO_4.2H_2O$
Red	Hematite	$FE2O_3$
	Vermilion	HgS
Green	Malachite	$Cu_2(CO_3)(OH)_2$
B. White	Native white lead	$Pb_3(CO_3)(OH)_2$
Red	Red lead	Pb_3O_4
	Rose madder	Lake on $Al(OH)_3$
Green	Chrysocolla	$CuSiO_3.2H_2O$
	Terre Verte (glauconite)	$K(Fe,Mg,Al)_2(Si_4O_{10})(OH)_2$

Table 12-2. Pigments used in European easel painting for A.D. 1650-1750 (Kuhn 1973)

Color	Material	Composition
White	Lead white (199%)	$Pb_3(CO_3)(OH)_2$
Red	Vermilion (65%)	HgS
	Red Lake (40%)	Lake on $Al(OH)_3$
	Red ochre (50%)	Fe_2O_3
	Minium (10%)	Pb_3O_4
Green	Verdigris	$Cu_3(CH_3)(OH)_2(OH)_2$
	Green earth (terre verte)	Fe Mg Al K

PROCEDURE

Samples were prepared for x-ray diffraction, x-ray fluorescence, and microchemical analysis. Pigments within the grave offerings (80-1209-982, -1102, -1170, -1478) were mixed with sandy soils. Pigment particles were picked by hand with ultrafine tip tweezers and tungsten carbide needle under 15-40x magnification. Preliminary petrographic identifications were made at this time.

Pigments were ground in a mortar, mounted on a petrographic slide, and placed in the Diano x-ray diffraction system. Inhouse mineral standards of hematite, vermilion, malachite, and white lead were used as standards of comparison in analysis. Samples (80-1209-982, -1102, 1170, -1202, -1478) were analyzed by diffraction.

X-ray fluorescence analysis of the sherds was conducted on several samples to identify major elements of these pigments (80-1209-696, -1202). Mineralogical standards were used to calibrate the instrument. XRF analysis was also

Table 12-3. Pigment samples from Cedar Grove

Catalog Number	Provenience	Type	Pigment
80-1209-696	Burial 11	Ceramic: Hodges Engraved, var. Candler	red
80-1209-982	Burial 7	Mussel shell	red
80-1209-1102	Burial 7	Vessel exterior	copper salt stain
80-1209-1170	Burial 9	Mussel shell	red
80-1209-1202	Burial 12	Ceramic: Hodges Engraved, var. Armour	red and white
80-1209-1478	Burial 7	Mussel shell	green

Table 12-4. Results of Cedar Grove pigment analysis

Catalog Number	Name	Material	Technique	Notes
80-1209-696	red pigment on sherd	Hematite	XRF Petrography	XRF test: Hg negative; Fe higher in pigment sherd than sherd alone
80-1209-982	red pigment in soil	Hematite	Petrography XRD	extracted
80-1209-1102	copper salt stain in soil	Malchite	Petrography XRD	extracted
80-1209-1170	red pigment in soil	Hematite	Petrography XRD	extracted
80-1209-1202	red pigment on sherd	Hematite	XRF	Hg test negative; Fe test positive and greater than sherd body
80-1209-1202	white pigment on sherd	Kaolin	Microchemical XRF and XRD	XRD test: no lead white; XRF: no lead visible XRD for calcite (burnt shell), gypsum: negative
80-1209-1478	green pigment in soil	Malachite	Petrography XRD	extracted

performed on the ceramic substrate to identify the elemental differences between substrate and the pigment samples.

Microchemical analysis was performed on samples (80-1209-1202) to observe presence or absence of a carbonate pigment.

RESULTS

The results of the pigment analyses are presented in Table 12-4. The red pigment on sherd 80-1209-696 was set in the engraved lines and was extremely thin. X-ray fluorescence analysis was run on a whole sherd. The test for mercury (Hg) was negative, therefore, it was not vermilion. The iron (Fe) concentration was higher in the pigment and sherd as a substrate as compared to the sherd alone. Petrographic observations verified presence of hematite.

The red pigments (80-1209-982 and -1170) and green pigments (80-1209-1102 and -1478) in the grave offerings were extracted from the sandy soil by hand picking. X-ray diffraction identified the red pigments as hematite and the green pigments as malachite. Petrographic analysis confirmed these findings.

The red and white pigments on the sherd 80-1209-1202 presented some problems in analysis. There was insufficient sample of red pigment to perform x-ray diffraction analysis using standard laboratory methods. X-ray fluorescence analysis was used to test for mercury and iron. The mercury test was negative. The iron concentration was higher for the pigmented area and substrate than the substrate alone. It was concluded that the pigment was hematite. The white pigment was the most extensively tested pigment. X-ray fluorescence analysis was used to test for lead; the test was negative. X-ray diffraction was used to test for calcite, gypsum, and lead white using standards of comparison. Microchemical analyses were also performed to test for a carbonaceous pigment. The test was negative.

Finally, with all those possibilities expended, Kaolin or white clay remained as a possible pigment. A mineralogical standard of Kaolin and the unknown pigment were compared. The white pigment was found to be Kaolin or white clay.

CONCLUSIONS

Although the historic Caddo at Cedar Grove, Arkansas were probably in contact with European traders, directly or indirectly, we did not observe European pigments in this study. It was suspected that lead white and French vermilion were used to color engraved sherd 80-1209-1202. We found the use of earth colors only.

The pigments observed in this study, malachite (green), hematite (red), and Kaolin (white clay) would have been available U.S indigenous sources.

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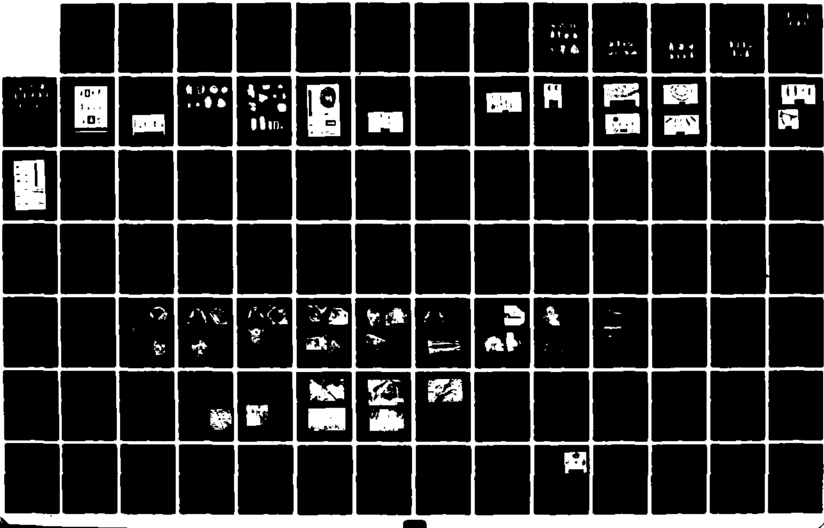

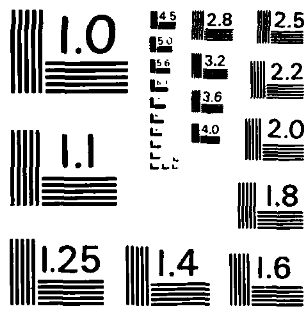

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Chapter 13

LATE CADDO SUBTRACTIVE TECHNOLOGY IN THE RED RIVER BASIN

Marvin Kay

INTRODUCTION

A legacy of subtractive technology are stone, bone and shell artifacts. Their manufacture is by processes which selectively remove mass. Ultimately the result is a finished object and fragmentary by-products of a manufacturing process. If only in this respect, all subtractive technology artifacts share a common logical base for analysis. For it is the manufacturing process that is the most robust feature about these artifacts. Artifact style, function, or use-life are often more difficult to evaluate. But it is often possible to do so in a technological study, once consideration is given to their systemic interrelationships and the effects of variable discard behaviors, archeological context and sampling are addressed.

It is argued here that the key to an artifact analysis is to develop appropriate models of artifact manufacture, use, discard, and retention within an archeological context. Toward this end this study explicates a general systems *model of subtractive technology.* As one of several possible applications, the late Caddo stone, bone and shell artifacts from two Red River sites, Cedar Grove and Sentell, are analyzed. The majority of these items are chipped stone artifacts which, naturally enough, receive the most attention. Additionally, it is important to note as well that the primary focus is with technological details of manufacture and use-life rather than tool use-wear. The latter, however, could be assessed in the context of our *model of subtractive technology.* But it is not necessary to do so to appreciate the model's application. Nor was it possible to do so for budgetary reasons.

By employing this model, I shall attempt to do two things. First, a necessity will be to explain how the model ought to work and why it is conceived to be better than other analytical devices. In this respect, a debt is owed to the formative work of Collins (1975), and in many aspects this statement is an extension of his pioneering ideas as well as a sympathetic criticism. Second, it will be equally essential to operationalize the model and show its substantive contribution to the analysis of an empirical body of data.

Toward this end the Cedar Grove and Sentell collections afford an instructive test case. The two sites are on similar point bar deposits adjacent to abandoned channels of the Red River, typologically and radiometrically equate with the Caddo IV and V habitations, and appear to have similar records of biotic and abiotic resource exploitation. From the point of view of a subtractive technology, this Red River locality is resource-poor, especially in terms of stone sources. Although we have evidence of long distance exchange of some resources into these sites, particularly marine shell from the Gulf Coast, this mechanism is not the most likely process used in lithic procurement. Instead I shall show that the lithic procurement was almost totally a local endeavor which bears directly on subsequent attempts to manufacture tools. Other than the few marine shell items, no shell or bone artifacts are clearly derived from exotic sources either.

The subtractive technology manifest in these collections will be treated as unified site systems of resource procurement, artifact manufacture, use and discard. Admittedly, this is a simplification of reality, and there may well be significant differences in the way artifacts were manufactured and consumed at either site. To the degree that it is possible, potential variation in discard behaviors will be identified to specific artifact classes or categories. A listing of technological categories, individual artifacts and their proveniences is also included as Appendix X.

This analysis also employed replicative experiments in bipolar percussion flaking as a means to partially identify and classify lithic artifacts from the two collections. These experiments will be described in detail because of the insights they provide into the technology of bipolar flaking exhibited by the lithic assemblages from Cedar Grove and Sentell, and our faculty for lithic artifact classification.

This report documents the results of this study in the following fashion. First, a *subtractive technological model* is presented and critiqued. Archeological sampling and data for Cedar Grove and Sentell are highlighted next, as they pertain to the substantive application of the model. Third, the model is explicated through analysis of the two sites' collections. In this, the discussion addresses the overall methodology, experimental design, and descriptions of lithic, bone and shell subsystems and artifacts. Results are then compared with other Red River Caddo analyses, followed by summary conclusions and recommendations for future work.

THE MODEL

Classification of stone tool production and use has been a prime feature of previous subtractive technological models (Shafer 1973; Collins 1975; Sheets 1975). There is, however, no reason this approach could not be extended to all products of subtractive technology. Such an approach is advocated here because it is the more productive, economical, and sufficient methodology to classify and interpret items of subtractive technology. By this I mean that a general model should allow for : (1) recognition of all major factors of subtractive technology tool production, use, discard, and final archeological context, (2) efficient derivation of artifact categories in terms of material, manufacture, use-life, use-wear, discard behavior, and archeological context; and (3) further investigation of analytical problems designed either to independently cross check results or to carry forward the investigation to its next logical step.

Collins's 1975 paper, entitled "Lithic technology as a means of processual inference," provides a logical point of departure for developing a general systems model of subtractive technology. His explicit recognition of ecological, cultural systemic and archeological contexts as the three primary dimensions of the systems model is a main contribution to the model proposed here.

Furthermore, some of the terminology of the general model derives from Collins, and along with him, this model is a specific application of Schiffer's (1972) general observations that contrast archeological from systemic contexts. Moreover, Collins's interest in comparative, interassemblage and intra-assemblage classification, or an etic taxonomy of chipped stone artifacts, is certainly shared by me. I have, in fact, attempted to apply his system in this context (Kay 1982:346-370; Kay 1981:11-27) and have, I think, a genuine appreciation for what Collins set out to do.

One might wonder why, then, I would elect to abandon Collins's model, not merely as an analogue for the general subtractive technology process but also specifically as it addresses chipped stone tool production.

My reason for this is threefold: First, in model building it is far more practical to begin with the general case and then work to the specific. Second, Collins's model fails to insure replicability of classification results among independent investigators but, more important, is inadequate as a universal appraisal of the chipped stone reduction process. Thus, although Collins (1975:25-26) asserts his model accounts "for each manufacturing step in any and all specific, or emic, technologies", his model will be shown to be at best one of specific application to a limited repertoire of chipped stone reduction techniques. At worse, it will be shown that Collins's model is far more restricted in scope, and may only apply to his own analyses. Third, it may, and I believe will, prove possible to employ a single lexicon of classificatory terms for the products of subtractive technology. I shall attempt to show how this can be done by employing a paradigmatic structure to develop a processual taxonomy of subtractive technology. From this, it should be possible to specify a set of descriptive terms which would be appropriate for any example of subtractive technology. This is a far different approach than Collins's more-or-less mechanical rendition of "product groups", which cannot be accepted as a processual taxonomy of lithic reduction.

Aside from its perspective of the entirety of subtractive technology, there should be other conceptual and practical advantages which mandate use of the general model. The most obvious and important of these is its capacity to derive more specialized applications which may model either a particular technology, an artifact assemblage, or both. Whether the general case is explicitly defined, any specialized technological model can be shown to be its derivative. How adequate an explanatory tool the derived model is depends on at least two things: Does the general model accurately reflect reality? And, assuming it does, are its principles integral components of the derived model?

Now, returning to Collins's model, let us apply these two criteria. My purpose in so doing is not to castigate Collins for errors in logic but rather to illustrate how deficiencies in his model can and should be overcome in the development of a general model of subtractive technology.

Collins correctly notes chipped stone tool production is a linear process. Usually, the further this process has gone, the more refined, or stylized, are its artifact forms. Often at some point, change in technique is mandated by the experience of the knapper; by material quality, size, form, and quantity available; or by functional or stylistic considerations. Less understood but a contributing factor to change in technique is idiosyncratic or innovative behavior on the part of a knapper. In any event, it is often possible to define a specific reduction sequence either by experiment (Newcomer 1971) or through observation of artifact assemblages (Bradley 1975; Cahen and Keeley 1980).

For model building, the problem Collins attempted to resolve was: how should the chipped stone reduction sequence be divided into a series of logical steps, each of which having its own readily identifiable technological products (or "product groups")? In his answer Collins delineated (1975:Figure 2) seven product groups which define an expected range of chipped stone artifacts one might recover from an archeological context and their systemic interrelationships. To illustrate, Product Group 1 is the result of raw material acquisition; Product Group 5 refers to artifact use exclusively; and Product Group 7 is the remnants of specialized disposal processes. The defining criteria for a product group would be the morphological attributes of its artifacts and/or its inferred systemic context.

No matter how well intentioned an investigator is, nor how well versed in the mechanics of chipped stone reduction techniques, it is virtually impossible to apply Collins's criteria for class membership in one product group or another without being (1) hopelessly arbitrary and (2) individualistic. This happens because Collins failed to recognize that the product groups are defensible only within the cultural system, rather than their archeological context.

A practical consequence is that lithic reduction sequences having a larger number of identifiable steps than the three Collins (1975:20-22) allows are forced into a smaller, arbitrary analytical space, or product group. Probably this would be true, for instance in Folsom point production (Flenniken 1978). However, even when only three steps or less might logically be indicated in an analysis, they need not be the ones he describes. Bipolar percussion lithic reduction (Leaf 1979:Figure 2) is a case in point. Then too, fragmentary or broken specimens, especially, may lack all or some of the diagnostic attributes needed for product group assignment. Either they languish in an indeterminate group or they must be listed as tentatively assigned to one of several product groups. Furthermore, there is no assurance that any two investigators would classify materials independently in the same manner. The ambiguity and arbitrariness of dividing a lithic reduction sequence is thus compounded by an inability to intersubjectively certify results. These problems severely if not fatally compromise the integrity of artifact classification derived from Collins's model.

Thus, the logical deficiencies of Collins's model can be seen to be of two kinds. First is the failure to clearly differentiate lithic production as a process from its subsequent archeological context. Second is the failure to employ taxonomic procedures in developing the product groups.

How then should these deficiencies be surmounted in proposing a general archeological model of subtractive technology?

The chief conceptual problem is to dichotomize the process of artifact production, use-life, and discard from the archeological product of these and other natural processes. Processual or taxonomic classification of these products may then attempt to identify where an artifact logically fits within the spectrum of its production, use-life, and discard. But it is essential to recognize that classification is inherently a partial and indirect measure of systemic cultural processes.

Figure 13-1 presents the proposed general processual model for subtractive technology. The process half of the model is on the left. On its right is the archeological product.

For purposes of simplicity only, the archeological product is defined by primitive terms of material remains and their configuration in time and space. Even though the archeological product is often more complex, it will be useful to regard it as only this, and then to develop appropriate technological analyses as a first step toward understanding the material remains. Gould (1980:138-160) provides an insightful example of how such an analysis might be designed.

The process half of the model serves two purposes. First, in a parsimonious fashion it delineates the linear sequence of artifact production, technological products, tool use, and artifact discard and/or recycling. Second, it affects a paradigmatic classification of subtractive technology artifacts which can be employed in technofunctional and stylistic studies. These topics are further developed as follows.

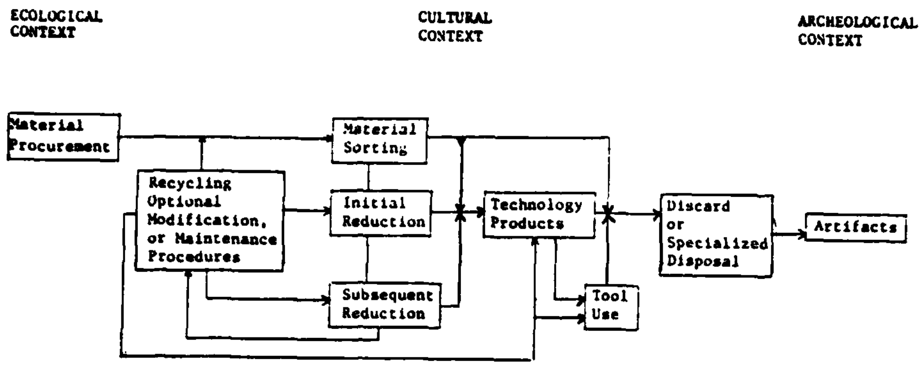

Figure 13-1. General processual model for subtractive technology

SYSTEMIC PROCESSES

Ecological and cultural contexts are the two domains under which any technology operates. Systemic, subtractive technology processes are conceived as being mutually exclusive for either domain. On the one hand, initial resource procurement pertains solely to the ecological context. On the other hand, all subsequent subtractive technological manipulations adhere to the cultural context.

Ecological Context

Material procurement is the prime activity definable. This refers to all procedures utilized to acquire a resource which can subsequently be modified by subtractive techniques. The function of a technological analysis in this case is to specify the ecological context from which a resource came and the mechanism of procurement.

Cultural Context

Processes leading to a technological product: tool use, optional modifications or maintenance procedures, recycling, and discard or specialized disposal are the prime activities noted. Processes leading to a technological product include material sorting, initial reduction, and subsequent reduction, if needed. Specific technological products, or artifacts, are produced at each of these steps, and tool use may follow any step or linear combination of steps. Optional modifications or maintenance procedures may occur during artifact production or its use-life; recycling of artifacts either as similar or different items may also occur during artifact production or use-life. Thus, optional modifications, maintenance procedures, and recycling are viewed as secondary, or attendant processes that may coincide with any or a linear combination of primary procedures which result in a technological product, tool use, discard, or specialized disposal. Discard or specialized disposal are the final cultural processes which in essence remove artifacts from a cultural system. The two are differentiated because they describe significant variation in removal processes. Discard behaviors, for instance, would encompass either planned or unplanned loss of technological products from a cultural system but without any necessary regard for their ultimate context. Specialized disposal would refer exclusively to planned removal of technological products when their ultimate context is clearly specified, as in a mortuary context or a cache. Discard or specialized disposal may occur after any of the preceding primary or secondary subtractive technology processes.

SYSTEMIC CLASSIFICATION

A comparative, or etic, classification of subtractive technology products is affected by the paradigmatic process of opposing contrasting dimensions in a nonhierarchical fashion, as discussed by Conklin (1955, 1962). The regular intersection of opposing dimensions defines contrast sets, or categories. For subtractive technology, three opposing dimensions are necessary and sufficient to isolate a primitive core vocabulary of five terms:

material rejection: material selection (M:M)
no reduction: reduction (R:R)
no tool use: tool use (T:T)

Derivation of the five contrast sets is shown in Figure 13-2 and their terminology is:

debitage: MRT
blanks: MRT
preforms: MRT
expediency tools: MRT
finished tools: MRT

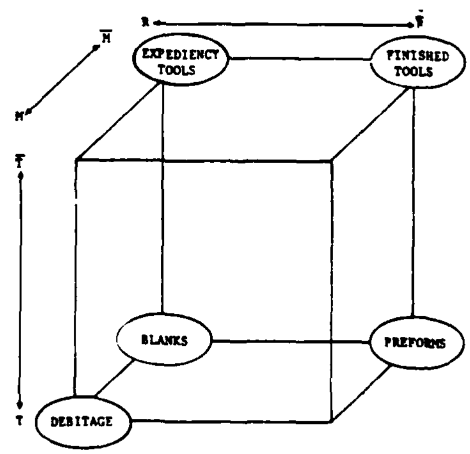

Figure 13-2. Paradigmatic structure of substractive technology

Levels of Contrast	Process: REJECTION	Process: MODIFICATION	Process: TOOL USE
SUBSEQUENT REDUCTION	Third or higher order debitage	Refined preform	More finely finished tool
INITIAL REDUCTION	Second order debitage	Initial preform	Finished tool
MATERIAL SORTING	First order debitage	Blanks	Expediency tool

Figure 13-3. Primitive economy of subtractive technology

It is also clear from our model (Figure 13-1) that the subtractive technology process is both linear and hierarchical. Thus, a subtractive technology taxonomy can also be developed (Figure 13-3) by taking advantage of the natural levels of contrast and their order of superordination:subordination expressed in our model. As such, paradigmatic procedures are seen to be integral to the formulation of a taxonomy of subtractive technology. This further results in the expanded lexicon needed for systemic classification. It is not necessary, however, to attempt to identify all possible contrast sets to appreciate the utility of this approach. It is only required that similar opposing dimensions may be logically seen to follow from it, that is to say, there is a regular, predictable, and realistic method to generate the terms of the model and their linear and hierarchical relationships. If our model does all of this, then it can be viewed as well as a "grammar" of subtractive technology, and one which satisfies the analytical and data recording tasks of subtractive technology research.

The "grammatical rules" of our model are:

1. Primary subtractive technology procedures define a linear, hierarchical, taxonomic system of artifact manufacture, use-life, discard, or specialized disposal;

2. These primary procedures stand in opposition to secondary, or optional, procedures of modification, maintenance, and recycling which may occur within any paradigmatically defined contrast set;

3. The superordinate: subordinate relationships of the primary processes, material sorting, initial reduction, and subsequent reduction, identify linear, hierarchical levels of contrast; and

4. For any hierarchical level, the paradigmatic process of contrasting opposing dimensions of primary and/or secondary processes, and defining categories by their regular intersection is necessary and sufficient to establish taxonomic classes.

EXPLICATION

Although the model, I think, serves nicely as a systematic description of the subtractive technology process and its products, its explication rests with each artifact assemblage under study. As a structure for analysis, our model should bring into focus both the logical processes and results of subtractive technology and what is expected to occur in any archeological context. The most elemental, or primitive, set of artifacts which may occur in any archeological context would be the debitage, blanks, preforms, expediency tools, and finished tools. Their configuration in time and space plus the diagnostic attributes of manufacture, use-life, optional modification, maintenance, or recycling should constitute the minimal classes of information expected in technofunctional and stylistic artifact studies.

ARCHEOLOGICAL SAMPLING AND DATA

Cedar Grove and Sentell, the two late Caddo sites on the bank of the Red River, were partially excavated in 1980 and 1981 before completion of a revetment being constructed by the Corps of Engineers, New Orleans District. The more extensive excavation program was conducted at Cedar Grove (Schambach et al. 1982; Trubowitz, this volume), where primarily a Caddo IV or V (A.D. 1500-1800) component, or components were delineated. The test excavation of Sentell (Trubowitz and Schambach 1982) defined both Caddo I/II (A.D. 1000-1400) and Caddo IV/V components. The Caddo inhabitations of either site are aligned with a natural alluvial ridge, or the crest of a point bar and primarily its westward slope. Both sites also share similar postdepositional histories, which include historic usage (in the case of Cedar Grove as a cemetery) and burial during the 1927 flood. Their excavation to a large degree depended on mechanical trenching and stripping of overburden and—in the case of Cedar Grove—removal of the aboriginal midden itself.

The material remains from either site came from undifferentiated midden, from structural features or graves (Cedar Grove, both aboriginal and historic), and from mixed prehistoric and historic midden fills. Depending on the type of deposit and the amount of time to do the excavation and processing, the various fills were treated differently. However, the majority of the excavated fills were waterscreened through 6.4 mm (1/4 inch) wire mesh; sediment columns 50 cm square and 10 cm thick or feature fills were subjected to either waterscreening through 1 mm mesh or flotation through 0.4 mm mesh. From the point of view of analysis of subtractive technology artifacts, the archeological samples are generally adequate as they comprise most of the debris sizes expectable. A limitation, however, is that the debris smaller than 6.4 mm is undoubtedly underestimated. Even so, this does not seriously restrict the analysis.

Except for the artifacts either hand excavated and point plotted or floated from the aboriginal graves, most of the material remains are from midden units. A probable house feature was partially excavated in the indirect impact zone at Cedar Grove as well, but its excavation was hindered by both historic graves and limited time, which precluded careful waterscreening of most of its matrix. This feature (Feature 3) was just west of the main ridge of the Cedar Grove site, where an historic levee with underlying muck ditches were constructed, and from which a line of 14 contiguous 2 x 2 m units were excavated (in the direct impact zone) and processed through the waterscreen. These 14 units also had considerable amounts of burned clay daub, similar to the probable house feature and two other potential house areas have been identified (Features 24 and 25). It seems likely that other house structures may have existed over a wider area of the natural ridge, or that the midden represents the dismantlement of house structures and their material remains into an extensive midden sheet centering on the ridge. In either case, I assume that the material samples from the better controlled excavation units are roughly similar to samples from less well controlled excavation areas. And in this analysis they are treated as site-unit samples except for the aboriginal grave goods.

Prior to this analysis, laboratory sorting had isolated the shell, bone and stone artifacts, stabilized the bone and shell items, and roughly sorted and tabulated stone artifacts into three categories: (1) chipped stone (cores and core fragments, preforms and tools), (2) ground/polished stone and (3) flakes/blocky fragments/shatter. The bulk of the material came from Cedar Grove.

All stone artifacts and potential artifacts were completely resorted by me. This did change the overall

tallies by weight or count for these items, with major differences recorded in the former chipped stone and ground/polished stone categories. Also I found the flakes/blocky fragments/shatter category to be generally too inclusive for most analytical needs and most of the additional items of chipped or ground stone were retrieved from this category.

Even so, the experiments with bipolar cobble reduction did demonstrate the utility of the flakes/blocky fragments/shatter category, as the resulting debris proved difficult to classify as lithic artifact types. In fact, it became clear that the distinguishing features of bipolar cores, flakes, pieces esquillees and shatter often merged or were truly indistinct. For the most part, these are intuitive typological categories which reflect extremes of variation in the bipolar reduction continuum. For Cedar Grove and Sentell, what became most important was the realization that much of the lithic debitage could be accounted for by the bipolar percussion reduction of Red River gravels, not that a specified quantity of this debitage could be labeled exclusively as a core, a flake or something else.

ANALYSIS

The analysis attempted to sort material into logical subtractive technology categories and to delineate the most probable linear sequence of manufacture, use-life and discard or specialized disposal. For finished tools or highly stylized preforms, typological identifications following the present literature were also made for both intra and intersite comparison of stylistically sensitive materials. Material identifications were a key element in the lithic studies and were chiefly oriented to determining the most probable source of stone used for either ground or chipped stone artifacts. To facilitate stone source identification and provide the needed raw material for experimental bipolar reduction, samples of Red River gravel (collected 2.3 km downstream from 3LA97 by Neal Trubowitz in January 1981) were also employed. Bipolar reduction experiments, described next, were designed to replicate the variability seen in the archeological samples of debitage, blanks, preforms, and tools. These experiments were helpful, and if not totally convincing, their limitations are largely due to my own inexperience with the technique.

BIPOLAR PERCUSSION EXPERIMENTS

My initial sorting of the lithic debris identified bipolar cores, flakes, and pieces esquillees. These all had the characteristic compression fractures where struck with a stone hammer and, opposing this, on the anvil end. Also multiple—and seemingly simultaneous—dorsal and ventral flake removals occurred which originated from opposing surfaces, or platforms. The material from which these artifacts had been struck was exclusively stream gravel, as evidenced by their highly patinated cortex, small size, variable shape and lithology. Most of this is chert but some novaculite, chalcedony, or agate also occur. That the two sites are within the Red River floodplain strongly suggests that most, if not all, of this gravel came from its gravel bars or those of its tributary streams nearby. A local source of this material is most likely. Its initial reduction must have posed a particular problem because of the general rounding of surfaces and corners which might be used as preliminary striking platforms, and small size—most specimens are thumb to fist size.

This sorting also produced other small stream gravels of quartzite or flakes of quartzite whose dorsal surface exhibited the diagnostic pitting, abrasion, or fracture due to impact against another stone. These hammerstones were common in the Cedar Grove collection. Anvilstones, other than a few of sandstone, or sandstone conglomerate, did not occur, however. Or, they were simply not recognized as such. This seems the more likely, given the quantity of lithic debitage probably produced by the bipolar percussion technique.

Using a single quartzite hammerstone and quartzite anvil, 10 bipolar percussion cobble reduction replications were conducted. Table 13-1 lists weights and sizes of the chert cobbles, quartzite hammer and anvil stones. The selection of materials attempted to approximate the size and quality of the archeological specimens, particularly of the quartzite hammers and chert bipolar cores. The chert gravels fell within two general groups as determined by weight, less than 50 g and about 100 g or more. The majority are of less than 50 g, are rectanguloid and tabular in shape and exhibit few internal flaws. Specimens as large or greater than 100 g are generally egg shaped and often are severely flawed by microfractures. To a high degree, this range in quality and size is present in the archeological materials as well, which seem to favor the smaller, tabular chert gravels with few internal flaws. The choice of the anvilstone for the experiment was based on the presence of similar blocky quartzite gravel in the Cedar Grove materials that have no obvious surface irregularities.

Table 13-1. Bipolar percussion cobble reduction experiments

Replication	Cobble weight	Cobble length	Cobble width	Cobble thickness
1	29.5	33.8	32.3	15.5
2	44.6	53.3	45.5	11.7
3	29.6	47.0	35.4	9.6
4	44.9	46.5	31.7	16.7
5	48.2	51.0	41.0	11.6
6	108.5	66.0	45.0	30.6
7	46.8	71.0	45.0	11.0
8	96.3	61.0	34.0	30.0
9	324.4	120.0	57.0	39.0
10	33.0	31.0	28.0	19.0
Hammerstone	66.1	55.4	30.6	28.0
Anvil	149.2	51.6	46.5	44.1

Table 13-2. Bipolar percussion experiment summary.

Experiment	Procedure and Results
1	Large tabular cobble was split using free-hand percussion. One piece was used in this experiment and the other in experiment 4. The cobble was placed at the edge of the anvil with the previous break perpendicular to the anvil face, allowing the maximum breadth of the cobble to be exploited in the bipolar experiment. Several small flakes or prismatic blades were then detached from the anvil end. Experiment terminated.
2	A tabular cobble was placed on edge, as in the first experiment and was struck in a perpendicular fashion with the hammer, but into the body of the cobble. This resulted in splitting the cobble into several flakes and pieces of shatter. Prior to this, the cobble was held against the anvil edge on one of its faces so that the cobble thickness was perpendicular to the anvil. The cobble edge off the anvil was then struck repeatedly and the cobble was occasionally turned, creating a bifacial retouched cobble.
3	Small tabular cobble placed initially as in first experiment, struck with hammer and detached a flake going the length of the cobble edge. Then rotated cobble so that the new, prepared surface was up and could be used as a striking platform. Holding the cobble on the anvil additional flakes were then removed, resulting in a wedge shaped core and a considerable amount of microshatter.
4	Basically a repeat of first experiment. Removed a large bipolar flake with prominent bulb of percussion on anvil end only, but on dorsal surface is a large hertzian cone due to impact.
5	Held large tabular cobble in fashion similar to first experiment but rotated the cobble so that it was struck by the hammer at obtuse angle, resulting in bifacial thinning of anvil end. Eventually broke the cobble in half, with one large flake having a bulb of percussion on the hammer end only.
6	Large cobble with a number of internal flaws. Mainly worked along cobble width due to flaws; reduced cobble to shatter.
7	Specimen worked across its thickness rather than on end in a fashion similar to the first part of experiment 2. Material of poor quality which affected flake removals.
8	Cobble was severely flawed making removal of flakes difficult and producing more shatter than anything else. Also detached flake from edge of anvil in this experiment.
9	Large egg shaped cobble severely flawed. Results of experiment was production of shatter mainly.
10	Small tabular cobble with no internal flaws. Removed 3 large bipolar flakes, all showing prominent bulbs of percussion at the anvil end, and most with flake erraillure at time of removal. Most "retouch" to core is at anvil end also.

Table 13-3. Bipolar percussion experiment results

Experiment Number	One Inch Weight	One Inch Number	Half Inch Weight	Half Inch Number	Quarter Inch Weight	Quarter Inch Number	Eighth Inch Weight
.	66.4	1	0.0	0	0.0	0	0.0
.	148.9	1	0.0	0	0.0	0	0.0
1	0.0	0	26.4	2	2.1	5	0.8
2	0.0	0	39.1	9	2.3	9	2.6
3	13.1	1	5.3	2	8.0	16	1.5
4	22.3	1	17.6	3	4.0	7	0.4
5	41.0	2	1.9	2	3.8	8	0.6
6	42.7	2	57.6	11	6.4	8	1.5
7	18.2	1	17.5	3	8.2	14	1.5
8	41.6	2	40.4	11	9.6	14	2.6
9	259.7	3	52.1	8	6.4	20	3.3
10	5.6	1	16.7	3	0.3	2	0.3

In each experiment the anvil was placed on top of a sturdy, padded steel table, a chert cobble was held on the anvil and struck with the hammerstone. The primary differences in the results were due to the direction of the hammer blow, the orientation of the chert cobble on the anvil, and the quality, shape, and size of the cobble. In most instances I held the cobble on the anvil edge and directed a blow perpendicular to its upper surface. This usually produced one or more flakes, blocky or splintery shatter. This process was repeated until either a particular artifact type was produced, or until the cobble was reduced to an unusable state (spent core, or core nucleus). The particulars of each experiment are summarized in Table 13-2.

The debris produced was trapped and subsequently weighed or counted (Table 13-3). Depending on the experimental results, some of the items were labeled according to their anvil orientation immediately after their production.

The experiments obviously did not replicate the actual conditions under which bipolar artifacts were produced prehistorically. For reasons of expediency and ease of documentation, the experiments were designed in the manner they were conducted. Nevertheless, their results are instructive of what might occur under aboriginal workmanship. Significant insight was gained in the following areas:

1. Bipolar percussion flakes have variable morphology. Prominent bulbs of percussion may be found on either the anvil end (distal) or below the point of impact (proximal). It is not at all unusual to see multiple bulbs of percussion at the anvil end (Figure 13-4a) and almost imperceptible fracture or pitting at the point of impact (Figure 13-4b). Other flakes lack a prominent bulb of percussion or for all practical purposes would be virtually indistinguishable from flakes produced by other percussion techniques (Figure 13-4c). Shafer (1973:111-112) arrived at essentially the same conclusion from his experiments.

2. With practice, either core modification or flake production can become specific, or less wasteful of material. By simply changing the orientation of the cobble on the anvil, its placement near an anvil edge, the direction and force of a hammer blow, it is possible to produce regularly shaped flakes of specified size and thickness (Figure 13-4d), to unifacially (Figure 13-4e) or bifacially (Figure 13-4f) work, or retouch, the cobble at its anvil end.

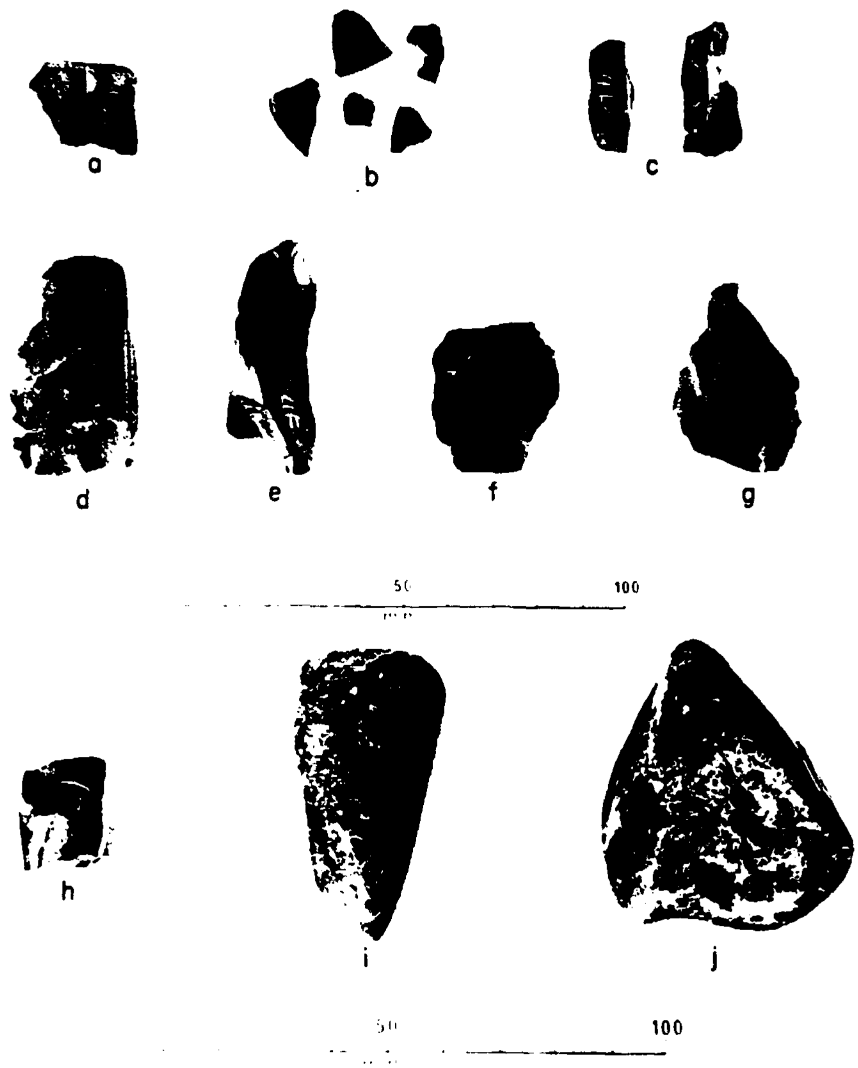

Figure 13-4. Bipolar percussion experimental debitage. a. bulbs of percussion anvil end (experiment 10); b. flakes lacking "diagnostic" features (experiment 1); c. regular shaped flakes (experiment 6); d. unifacial cobble retouch (experiment 7); e. bifacial retouch at anvil end (experiment 5); f. core nucleus (experiment 3); g. <u>piece esquillees</u> (experiment 2); h. impact pitting or fracture (experiment 4); i. hammerstone used; j. anvil stone used (AAS negative numbers 832770, 832771)

3. Core nuclei (Figure 13-4g) and pieces esquillees (Figure 13-4h) are natural by-products of bipolar percussion cobble reduction. Pieces esquillees, or the bipointed multifaceted nucleus, may occur as the end product of bipolar core reduction or as shatter from a bipolar percussion core, a nucleus or a flake. White (1968:660-662) also documents this from ethnographic observation of bipolar reduction among the aborigines of Australia and New Guinea.

4. Anvil wear may in many instances be almost undetectable from naturally worn stream cobbles which repeatedly impacted into other cobbles.

5. The production of microdebris is both common and prolific in bipolar percussion reduction of chert gravel. This small scale debris would generally be too small for further utilization. It would also be difficult to thoroughly remove this debris from the cobble reduction area, unless the underlying sediment was removed in bulk.

6. The reduction of small chert cobbles, especially those procured from stream gravels, requires techniques which offset limitations of their size, shape, and variable quality. Bipolar percussion techniques are well suited to this task because they require no prepared striking platform and can deal effectively and economically with even the smallest of chert cobbles. In many instances the employment of bipolar percussion is the only effective method to initially reduce a cobble, and it allows the subsequent use of other percussion or pressure flaking techniques as artifact manufacture proceeds. Thus where stone resources are of small size and irregular or rounded shape, bipolar percussion may be the subtractive technology of choice.

COMPARATIVE APPROACH AND ASSUMPTIONS

The analysis of the archeological materials employed a general, comparative framework and explicit assumptions about subtractive technology as a whole and the particular collections from Cedar Grove and Sentell.

The bipolar experiments served as a general analogue for the bulk of the lithic debris collected from the two sites. In characterizing these collections, reference was made to specific debris types produced experimentally or which could logically be expected, based on the experimental results. Experimental production of bone and shell artifacts was not attempted, but in most instances it was possible to determine the latter steps of manufacture from specific artifact attributes. In this, the truncation of an older surface by younger surface features was used to establish specific reduction sequences. The manner of truncation or mass removal further allowed identification of particular subtractive technology procedures. Comparison of an array of similar artifacts further established either the range of expectable variation in morphology, flaking or grinding, size or the placement of a specific artifact within its projected linear sequence of manufacture and use-life.

The general assumptions of subtractive technology utilized in this analysis are derived from the subtractive technology model. They are:

1. The process is linear in overall design and involves both primary and secondary operations, which condition artifact manufacture and use-life. These operations are identified in the section on the subtractive technology model.

2. The conventional notion of artifact style as it pertains to subtractive technology, in fact, is the sum of the technological processes of manufacture, artifact use-life and material constraints. Thus the typological classification of diagnostic artifacts according to their "style" is most productive where the artifacts experienced similar manufacturing processes and use-life, if nothing else.

Assumptions specific to the Cedar Grove and Sentell collections include:

1. The stone resources are of local derivation from stream gravels.

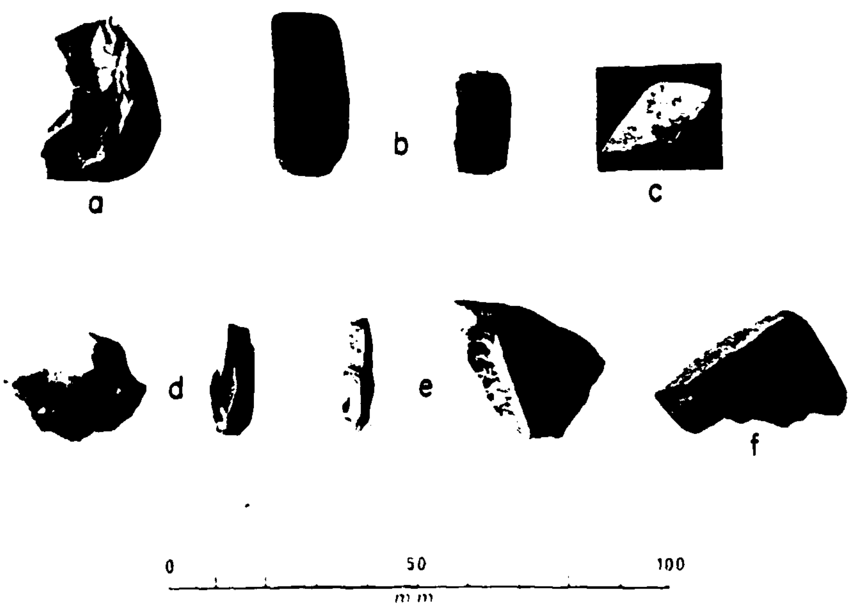

Figure 13-5. Cedar Grove debitage. a. bipolar percussion core; b. polar percussion cobble flake; c. quartzite hammerstone flake; d. flake with bifacial retouched edges; e. pieces esquillees; f. edge retouched cobbles (AAS negative number 832772)

2. Bipolar percussion reduction of stream gravels was the initial method of chipped stone artifact manufacture.

3. Other than items of marine shell, the bone and shell artifacts are of local derivation also.

4. Marine shell artifacts are products of a nonlocal resource procurement system.

I. CEDAR GROVE ARTIFACT DESCRIPTIONS

CHIPPED STONE

DEBITAGE

Lithic debitage is the most abundant category of artifacts. Before resorting of the chipped stone, a total of 17,135.6 g of flaking debris was recorded, as were 5534.5 g of undifferentiated lithic debris and 1,566 chipped stone artifacts (tool elements). From 11 of the 15 Caddo IV/V burials came 93.3 g of lithic flaking debris, of which Burial 3 accounts for 39 g; the rest of the debitage is from either the disturbed site surface or primarily the Caddo IV/V midden excavations in the direct impact zone.

The debitage is almost invariably a direct by-product of bipolar percussion cobble reduction and includes cores (Figure 13-5a), flakes removed from cobbles (Figure 13-5b) or shatter from the chert cobbles and quartzite hammerstones (Figure 13-5c). Much of this material is greater than 6.4 mm square and probably relates to the initial reduction of chert cobbles. Debitage expectable from other percussion or pressure working of either core or flake blanks, preforms, and finished tools would, in this case, be smaller than 6.4 mm square, as judged from flake scar sizes on these items, and generally was not collected. Four flakes with bifacially retouched edges (Figure 13-5d), however, probably represent debitage produced after the initial bipolar cobble reduction.

Debitage produced after bipolar cobble reduction consists of biface fragments and segments (unidentifiable as to location on a biface) of either finished bifacial tools or biface preforms. In this category are the 20 basal fragments of unnotched bifaces, all of which are probably point preform debitage, as determined by their size, overall flaking characteristics and breakage relative to the finished points. The majority (18 specimens) are fashioned from flake blanks, while the other two are either cobble core blanks or are indeterminate; of the latter, one is clearly heat fractured but not necessarily thermally pretreated (see Purdy and Brooks 1971). Other point or point preform debitage includes 19 bifacial midsections, 12 bifacial segments (of a total of 16), and 19 tips. Nine other biface basal fragments from cobble blanks complete this inventory.

Although clearly identified to the bipolar percussion technique, pieces esquillees (Figure 13-5e), edge retouched cobbles (Figure 13-5f) or even cobble bifaces (Figure 13-6) are not as easily classed as debitage, blanks, preforms, or finished tools. MacDonald (1969:88) subscribes to the view that most are tools. Microwear examination of these artifacts, however, is required to accurately place them into a technofunctional category, but was beyond the scope of this analysis. There are 18 pieces esquillees, 89 edge retouched cobbles, 27 whole and 14 fragmentary cobble bifaces.

Edge damaged flakes or shatter are a part of the debitage. These items were segregated from the other bipolar debris as a routine matter but were not further tabulated. The cause of edge damage is multiple. Some is clearly due to scraping or marring an edge with a steel tool in the excavation process. Steel streaks found on the adjacent surfaces of these items are fairly common. Further field processing, transport to the laboratory, and laboratory handling of bulk samples accounts for some damage also. Other damage may have occurred either before discard or shortly thereafter. Trampling of the site surface must have affected some of the debitage, and some of the damaged edges must be accounted for by the manufacture process and use alteration.

Use alteration is of course the subject of primary interest, as items listed as debitage but having use altered edges are probably tools. I am sure there are simple flake

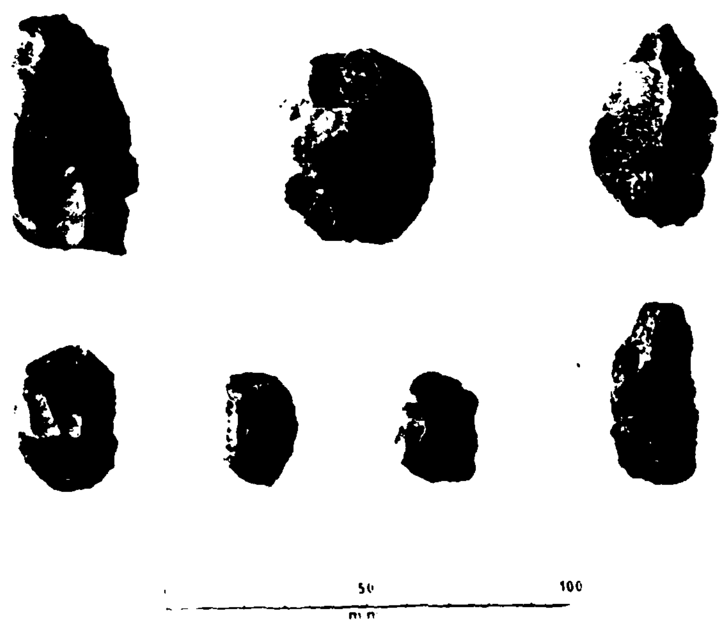

Figure 13-6. Cobble bifaces (AAS negative number 832773)

expediency tools of this type in the Cedar Grove and Sentell collections. However, it would have been impossible to sort these from the others without a systematic microwear analysis, which was beyond the scope of this study.

Thermal, or heat fracture (Purdy 1975) of the debitage and other chipped stone artifacts is not at all uncommon. The diagnostic heat crazing and potlidding of surfaces and curvilinear breaks are not, however, associated with distinctive color changes in a regular or predictable way. Thus, the assessment of heat damage or purposeful alteration as an optional material modification (Purdy and Brooks 1971) is especially difficult and imprecise. The importance of chert heat treating remains undetermined for the Cedar Grove chipped stone technology.

PREFORMS

Bifacially flaked preforms of hafted finished tools, primarily chipped stone points or perforators, are represented by six whole specimens (Figure 13-7). These vary from 25 to 54 mm in length, 17 to 33 mm in width and 5 to 14 mm in thickness. Three (Figure 13-7a-c) are fashioned from cobble core blanks; one (Figure 13-7d) is on a flake blank, two (Figure 13-7e, f) are indeterminate as to being either a core or flake blank. None is notched. Flake scars are generally broad and thin, what might be expected primarily from soft hammer percussion work.

An additional biface (Figure 13-7g) is also a possible large preform, or possibly a light duty cutting tool. The blank is indeterminte due to the fully invasive bifacial flaking, which is again most similar to that of the six other large preforms. The material is a slate gray, grainy chert, duplicated by many of the more complete cobbles and cobble fragments in the collection. Its dimensions are length, 53.6 mm; width, 28.7 mm; and thickness, 7.8 mm.

Four other specimens are either point preforms of identifiable point types, or are broken points which were rejected after unsuccessful attempts at optional maintenance, or recycling. Two identified as point type preforms include an ovate (Figure 13-8a) specimen and a triangular (Figure 13-8b) one. The ovate preform was thermally pretreated (or heat treated), is red in color and has the diagnostic microcrazing of its surfaces; its dimensions are: length, 36.4 mm; width, 14.9 mm; and thickness, 5.8 mm. Its flaking is fully invasive and is either extremely well controlled soft hammer percussion or coarse pressure work. The triangular preform is smaller, having a length of 19.9 mm, 10.8 mm maximum width and 4.2 mm maximum thickness, and is fashioned from a flake detached from a cobble. The flake striking platform is the distal, or tip end of the preform and is cortex covered. Blank modification is incomplete and consists of marginal bifacial pressure retouch of the flake's lateral edges only. Two specimens are both fragmentary and exhibit carefully executed, fully invasive bifacial pressure flaking. Their cross sections are biconvex to lozenge shaped. They are parallel sided but vary in basal shape. One is straight based with rounded shoulders (Figure 13-8c). The other is also straight based but is at a diagonal to the specimen's longitudinal axis (Figure 13-8d); its blank was heat treated, whereas the other appears not to have been. Both exhibit a characteristic optional modification, extensive grinding of the specimens' lateral edges. This would have facilitated continued bifacial pressure flaking of the ground striking platforms. The heat treated specimen is the more complete and is 39.4 mm in maximum length, 10.3 mm in width, and 5.0 mm thick; the other is not measurable in length but 9.7 mm wide and 5.5 mm thick. Although speculative, it seems likely that the two are preforms of the bifurcate based Maud points, or of corner notched points; if so, they would be evidence of their local manufacture.

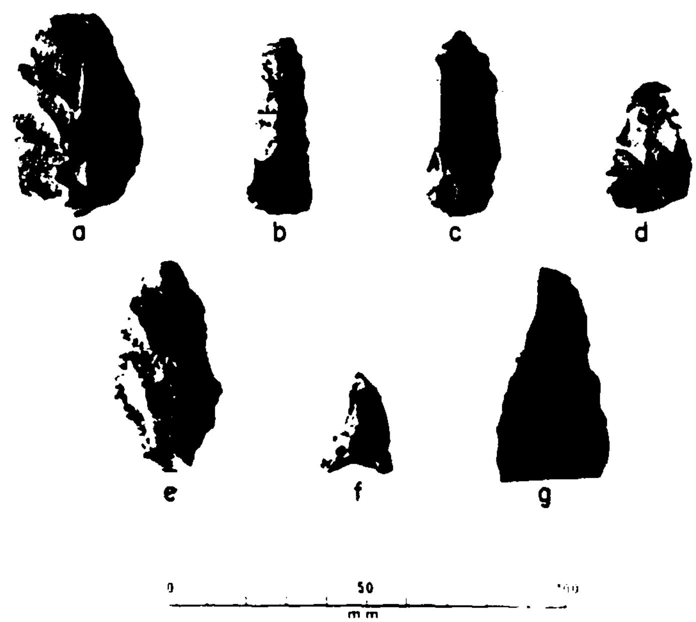

Figure 13-7. Bifacial preforms. a-c. core blanks; d. flake blank; e-f. blank indeterminate; g. large preform or light duty cutting tool (AAS negative number 832774)

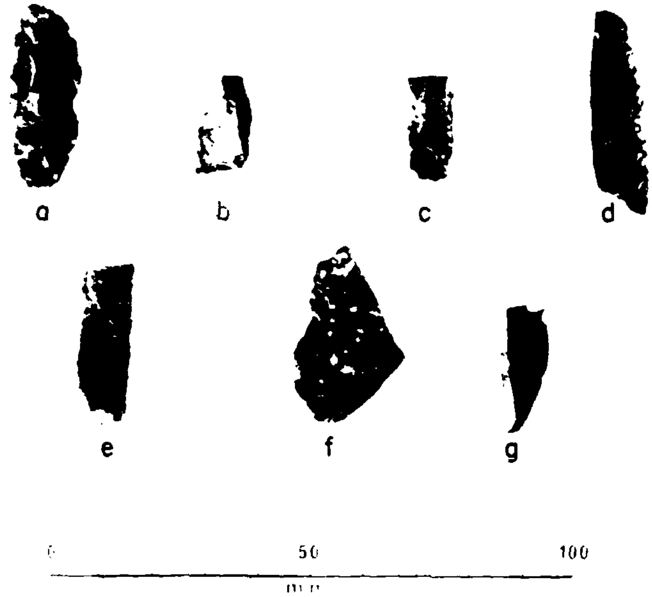

Figure 13-8. Bifacial point preforms. a. ovate; b. triangular; c-d. fragmentary and finished unifacial tools; e. bipolar percussion flake; f. burin or break? g. graver (AAS negative number 832775)

FINISHED TOOLS

Unifaces

Four artifacts fall into this general class. One (not illustrated) is a heat fractured cobble fragment and is edge "retouched." It should be noted that in heat treating chert, I have produced virtually identical retouch as a product of heat fracture. A second specimen is a utilized bipolar percussion flake, with what appears to be use retouch of its lateral margins. The specimen (Figure 13-8e) is roughly parallel sided with dimensions of 31.3 mm length, 13.4 mm width, and 6.2 mm thickness. This artifact contrasts to the many pieces of bipolar percussion debitage which exhibit edge damage but which could not be as clearly associated with tool use. A third item (Figure 13-8f) is a thin cobble, split by bipolar percussion with a possible burin facet on the break. Whether this functioned as a burin or was a fortuitous burin facet resulting from bipolar percussion cobble splitting is uncertain. A graving spur on the edge of a bipolar percussion cobble flake (Figure 13-8g) is the final unifacial item.

Arrow Points

Arrow points are morphologically varied and consist of whole and fragmentary specimens. These are triangular, ovate, bifurcate base triangular, corner notched, tanged, and contracting stemmed. Most are identifiable to well established Caddo arrow point types, or to general Mississippian Period types. In a typological sense only, the most problematical are the corner notched specimens and the triangular points, referred to here as, respectively, Scallorn (Bell 1960:84-85) or Fresno (Bell 1960:44-45). The ovate points are most similar to Nodena points (Bell 1958:64-65) more commonly found in eastern Arkansas. Bifurcate base triangular points conform to the type description of Maud points (Bell 1958:48-49), a typical late Caddoan arrow point. The sole tanged point also is readily identifiable as a Bassett point (Bell 1958:10-11), another late Caddoan arrow point. The one contracting stemmed point is either a Gary (Bell 1958:28-29) or a small Gary-like point, and is either an arrow or dart point.

Fresno. These small, straight side triangular points include one complete and seven basal fragments. The complete point (Figure 13-9a) is finely pressure flaked and was heat fractured after manufacture. Its length is 12.8 mm and it is 11 mm wide and 2.6 mm thick. One basal fragment is nearly complete and strongly resembles the small, marginally retouched triangular point preform (Figure 13-8b); this specimen is possibly also unfinished but is more thoroughly pressure flaked on both faces (Figure 13-9b). Its measurable length is 20.3 mm and it is 12.4 mm wide and 5.1 mm thick. A second basal fragment (Figure 13-9c) has a convex rather than straight base and was thinned after the blade margins had been bifacially pressure flaked. It is possible that this is either a preform fragment for a corner notched point or the blade element of a broken corner notched specimen which was in the process of being recycled. Its width is 18.9 mm and it is 4.7 mm thick. The other basal fragments range in width from 12.8 to 18 mm, and in thickness from 4.0 to 4.8 mm.

Nodena. Eight specimens of which five are complete and three are basal fragments comprise the sample of these finely pressure flaked, ovate points. Dimensions of the complete specimens range from 25.3 to 33.4 mm in length, 9.5 to 11.1 mm wide, and 4.2 to 5.7 mm thick; all are illustrated (Figure 13-9d-h). One of these (Figure 13-9d) was side notched subsequent to its manufacture, and this represents an optional modification. An additional point is too fragmented for accurate placement as a Nodena point but its size, flaking and outline are similar.

Maud. Four specimens are represented (Figure 13-9i-l), all but one is complete. Each has a characteristically deeply bifurcated base, straight blade edges which converge to the tip; in outline they resemble an isosceles triangle.

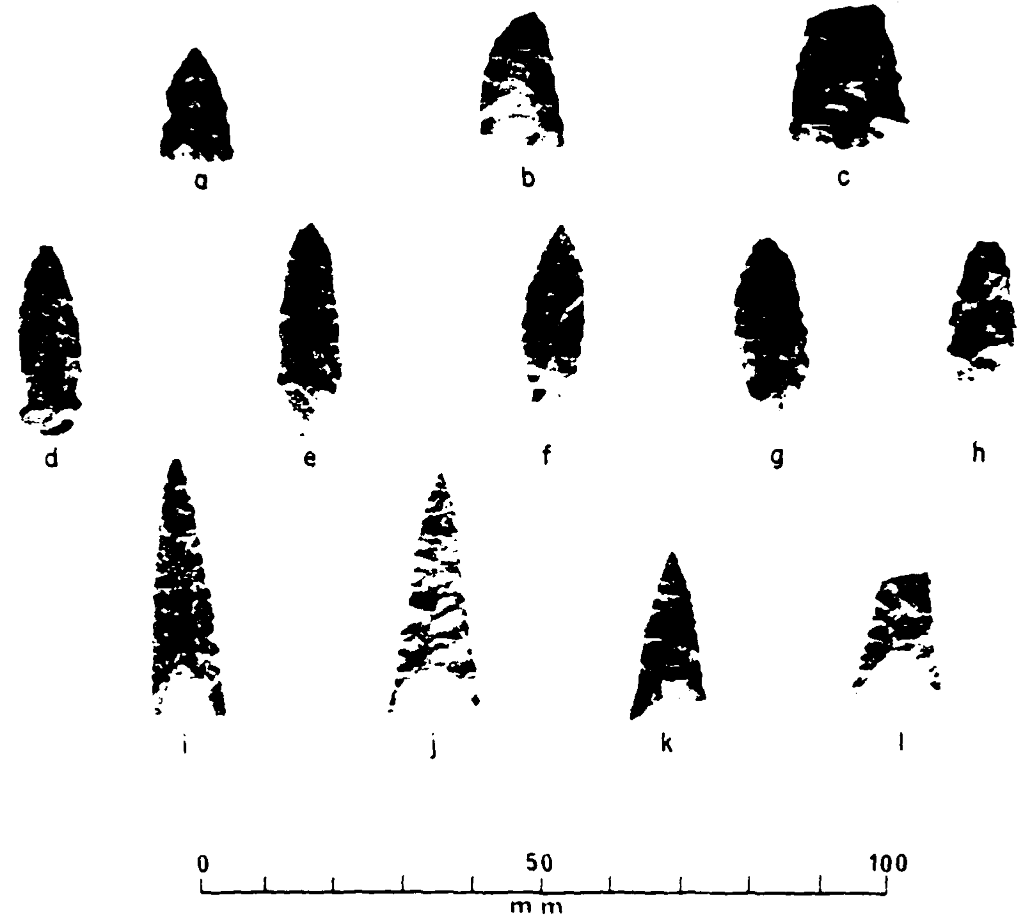

Figure 13-9. Chipped stone arrow points. a-c. Fresno; d-h. Nodena; i-l. Maud (AAS negative number 832776)

Three have finely serrated blade edges extending onto the basal ears; the fourth (Figure 13-9i) appears to have originally had serrated edges which now are virtually gone due to edge damage. Final blade flaking is extremely well controlled horizontal pressure flaking. The specimens range from 25 to 38.5 mm long, 11 to 19 mm wide, and 3 to 4.6 mm thick.

Scallorn. *Classifying all 13 corner notched specimens* as Scallorn points will not satisfy every point typologist who deals with Caddoan artifacts. There is considerable variation in basal, or haft element, morphology as the *illustrations show* (Figure 13-10a-g). Some (Figure 13-10c-e) could as easily be classed as Bonham (Bell 1960:10-11) or Hayes (Webb 1959:Figure 125g,h), which are more straight based varieties but would be early Caddo in age. One of these is from Burial 12, as is a Maud point. Others (Figure 13-10f, g) will satisfy no typological model of what Scallorn or its many similar forms should ideally be; nevertheless, they apparently satisfied the needs of their makers. The variation observed in these points is probably more important than a point type label. In any case, the presence of late Caddoan corner notched points, regardless of what they are called, is clearly documented at Cedar Grove as it is at other sites of similar antiquity (Webb 1959).

One could argue that strictly stylistic variation is documented by this sample. I think an as plausible if not more credible explanation would be that the sample documents both the physical limitations of the original flake blanks (Figure *13-10f, g) and recycling of broken blade* elements through creation of a new haft (Figure 13-10c-e). Support for the blade recycling hypothesis is gained through examination of the four blade element fragments which *retain some of the proximal* haft element (Figure 13-10i). The remaining proximal haft element has the characteristic straight sides seen in the probably recycled specimens. It would have been a simple matter to thin the broken proximal haft projection, by pressure flaking, into a serviceable haft.

Other than a heat fractured specimen obtained from Feature 18, in the probable house floor (Caddo Structure 1, Feature 3) of the indirect impact zone, no arrow points show unambiguous evidence of thermal alteration. In outline, the specimens are triangular, with angular or barbed shoulders. Dimensions of four complete specimens range from 20 to 30 mm long, 10.8 to 11.8 mm wide and 2.7 to 4.8 mm thick. The two smallest specimens range from 14.3 to 14.9 mm long, 7.8 to 9 mm wide, and 1.4 to 3.8 mm thick.

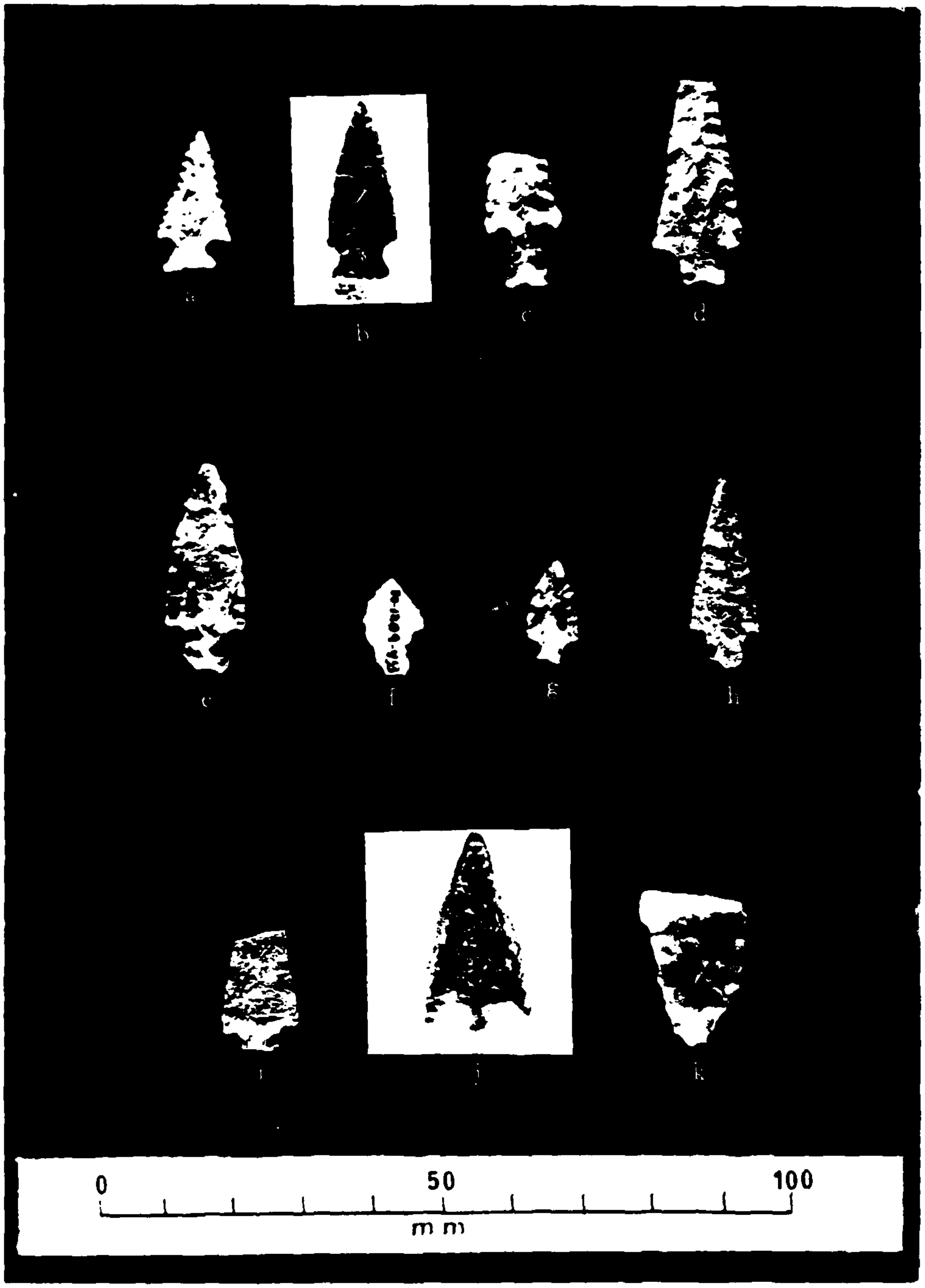

Figure 13-10. Scallorn, Bassett arrow point and Gary point(?) a-i. Scallorn; j. Bassett; k. Gary(?) (AAS negative number 832778)

Bassett. The single specimen (Figure 13-10j) is triangular, with straight blade edges which at the base form sharp, angular barbs. The basal tang is broken but probably the specimen's measurable length of 28 mm is fairly close to its original length; width was slightly more than 20 mm (one barb is also broken) and thickness is 3.5 mm. Flaking is entirely finely controlled pressure work which is fully invasive and has obliterated the former blank topography. The blade edges are somewhat damaged but record a fine serration similar to that seen on the Maud points from Cedar Grove. The specimen is from Burial 14.

Gary. The specimen (Figure 13-10k) is a basal fragment with a portion of the blade shoulder remaining. It has the typical convex base and is fully bifacially pressure flaked. Width at the shoulders is slightly more than the measurable 16 mm (due to lateral breakage) and its thickness is 3.8 mm. This specimen was found in S48.77 E157 general excavation.

Perforators

Six specimens are represented. All are fully bifacially flaked but fall within two morphological groups. The first are spike-like, narrow specimens having diamond cross sections (Figure 13-11a-d). Two of these are complete and probably were hafted into a larger handle of wood, bone or antler. The largest of these is 47 mm long, 7.4 mm wide, and 5.6 mm thick; the other is 34.4 mm long, at its base 12.4 mm wide, and 4 mm thick. The second group is comprised of two basal fragments of larger proportions (Figure 13-11e, f). Broadest at their base, the two have maximum widths of 14 mm and 17.4 mm, and are 7 mm and 5.4 mm thick, respectively.

GROUND STONE

EXPEDIENCY TOOLS

Hammerstones

A total of 23 whole and fragmentary specimens are represented. All are quartzite except for three fragmentary chert specimens. The eight whole specimens (Figure 13-12a-d) are modified solely by repeated use as a hammer, and have pitted or marred surfaces. None of the whole specimens is ground, nor is grinding evident on the 15 fragments. Whole specimens are egg-shaped to roughly spheroidal and vary in weight from a maximum of 114.7 g to a minimum of 29.1 g. Fragmentary specimens represent hammerstone failure and subsequent discard or loss; as such, they are all expediency tool debitage. Two fragments appear to be approximately one-half of split hammerstones; six others are hammerstones which have sustained major damage to a working surface or surfaces; and the remainder are spalls from a working surface.

Polished Cobbles

Whole and fragmentary chert cobbles exhibit highly polished, smoothed or faceted surfaces; of the five more-or-less complete specimens, two are polished on all surfaces (Figure 13-12e, f). But more common is extensive smoothing and polishing of either an end (Figure 13-12g) or a single broad surface (Figure 13-12h). The degree and placement of the polish is far different from what is seen on either fresh Red River chert cobbles or the other archeological specimens. Krieger (1949:157-158 and Figure 55i, j) refers to similar objects from the George C. Davis site as pot-smoothing stones and cites (1949:158) an ethnographic example of their use among modern Pueblo women. Their identification as pottery burnishing tools seems reasonable; if correct, it is supporting evidence of local ceramic manufacture.

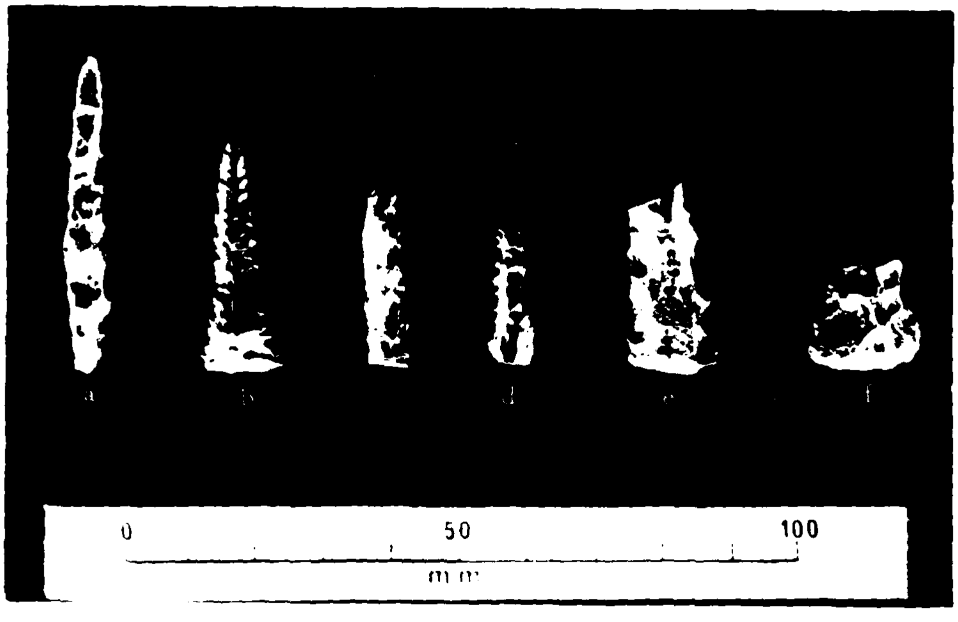

Figure 13-11. Perforators. a-d. narrow, spikelike; e-f. large basal fragments (AAS negative number 832779)

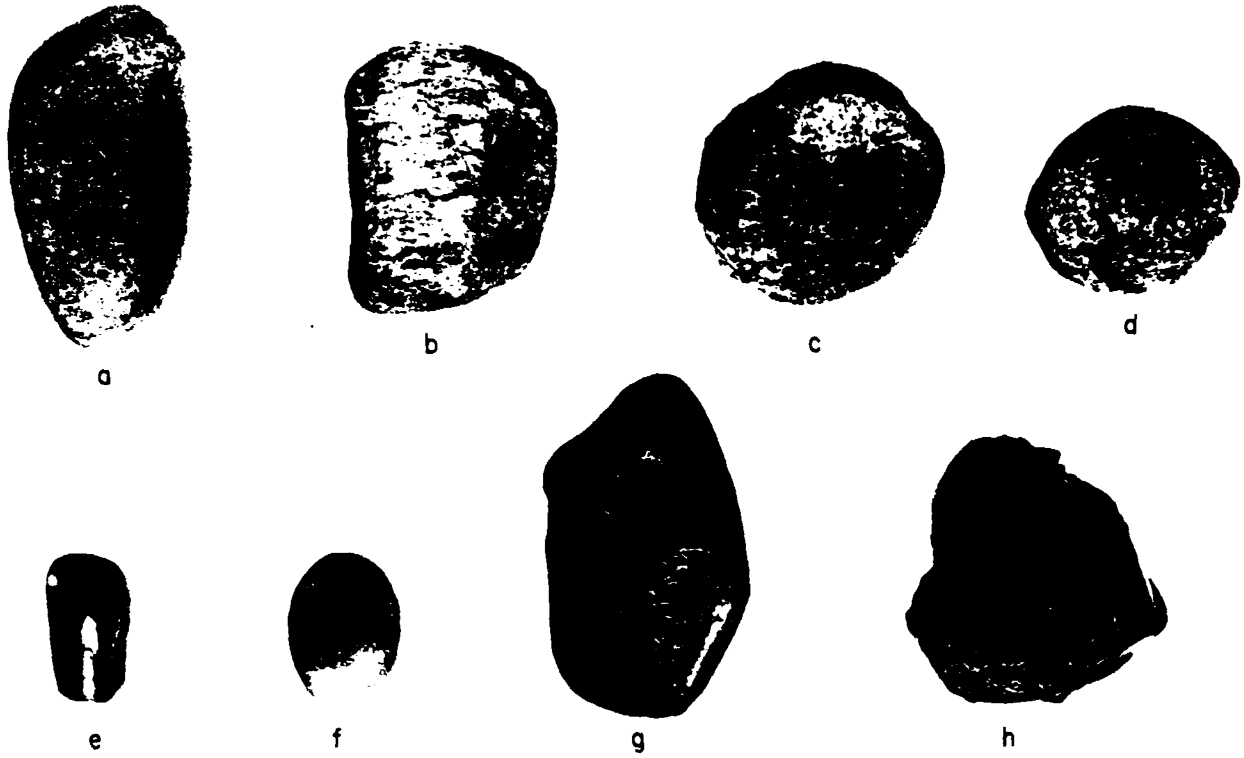

Figure 13-12. Ground stone expediency tools. a-d. quartzite hammerstone; e-h. polished cobbles (AAS negative number 832780)

In addition to the serviceable tools are three fragments, which represent debitage. One is a flake with a highly polished dorsal surface, the others are heat-fractured fragments. A final possible piece of debitage is the large specimen (Figure 13-12h) whose surfaces are extensively pitted by heat fracture.

Ground Slabs

Three large and two fragmentary specimens comprise the sample of ground slabs (Figure 13-13a-c); all are quartzite. No attempt to purposefully shape or alter the surfaces is clearly evident, other than pecking to resharpen a surface. One (Figure 13-13c) is multifaceted, and is highly ground and polished on three adjacent sides. All specimens would fit comfortably in one's hand, and were probably handheld rather than stationary grinding slabs. Weight of the largest is 642.1 gm.

In addition to these are 15 tabular pieces of quartzite which may have microscopic evidence of grinding or, alternatively, are candidate blanks for ground slabs. In either case, their presence on Cedar Grove is most likely due to human transport, and they would--if used--have been handheld.

Abraders

Three abraders (Figure 13-13d-f) are present from either midden samples or the probable house floor (Figure 13-13e) in the indirect impact zone. These all would have been handheld tools, and are either of sandstone (Figure 13-13d, e) or grainy chert cobbles (Figure 13-13f). The major modification is the production of mainly parallel grooves of variable length, breadth and depth; the probable house floor specimen is grooved on two opposing surfaces and the grooves intersect at right or acute angles but are approximately the same in other respects. The finest grooves are found on the chert cobble specimen, probably due to the hardness of this material. The only material available which could have grooved this object would have been another chert, novaculite, or similarly hard object. The single groove on one sandstone abrader (Figure 13-13d) is large enough and of the right shape to have accommodated a shank of antler or bone, and there are bone and antler artifacts which could have been ground using this or a similar abrader. The multigrooved specimen could also have been employed on softer bone, antler or shell items, or to grind the lateral edges of bifacial preforms.

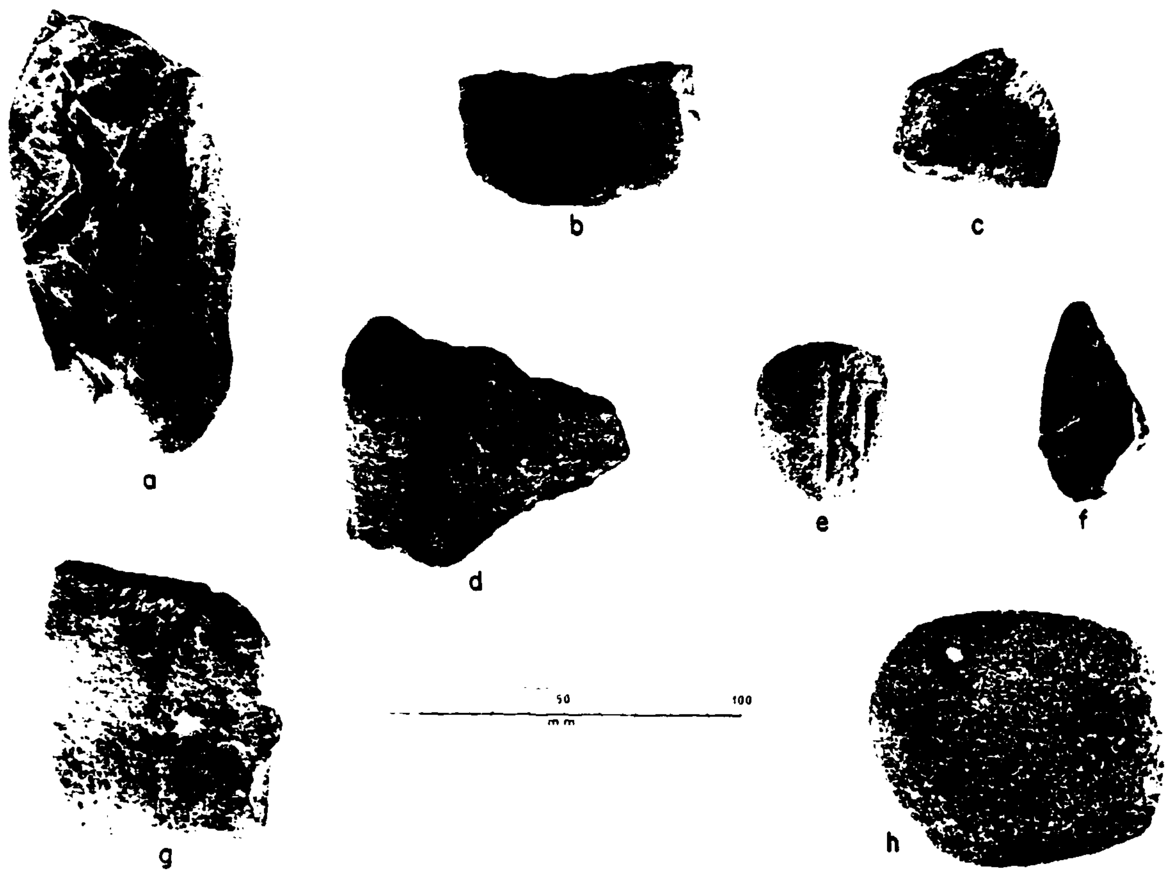

Figure 13-13. Ground slabs, abraders, and anvils. a–c. quartzite ground slabs; d–f. abraders; g–h. sandstone anvils (AAS negative number 832781)

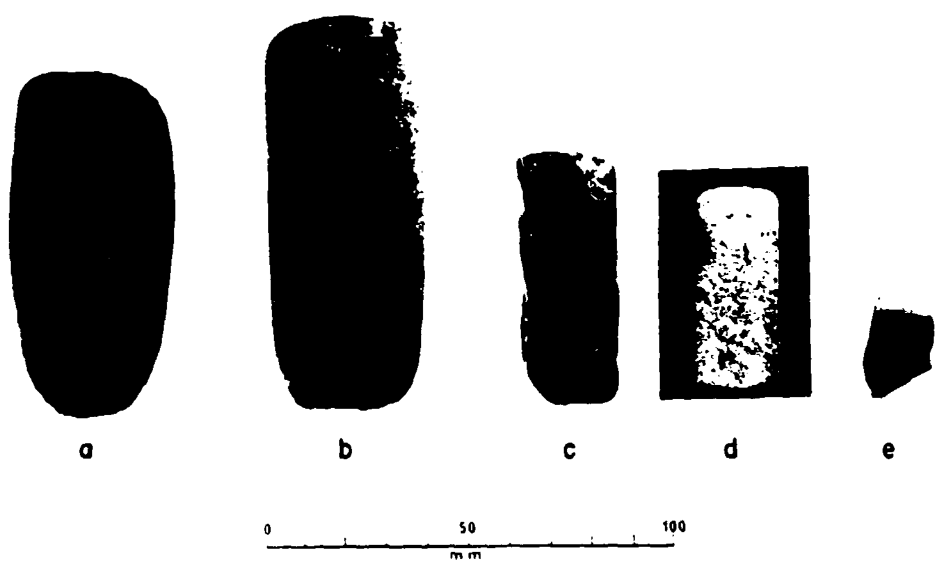

Figure 13-14. Cedar Grove petaloid celts. a. diorite celt; b. diorite celt preform; c–e. chert cobble celts or celt fragments (AAS negative number 832782)

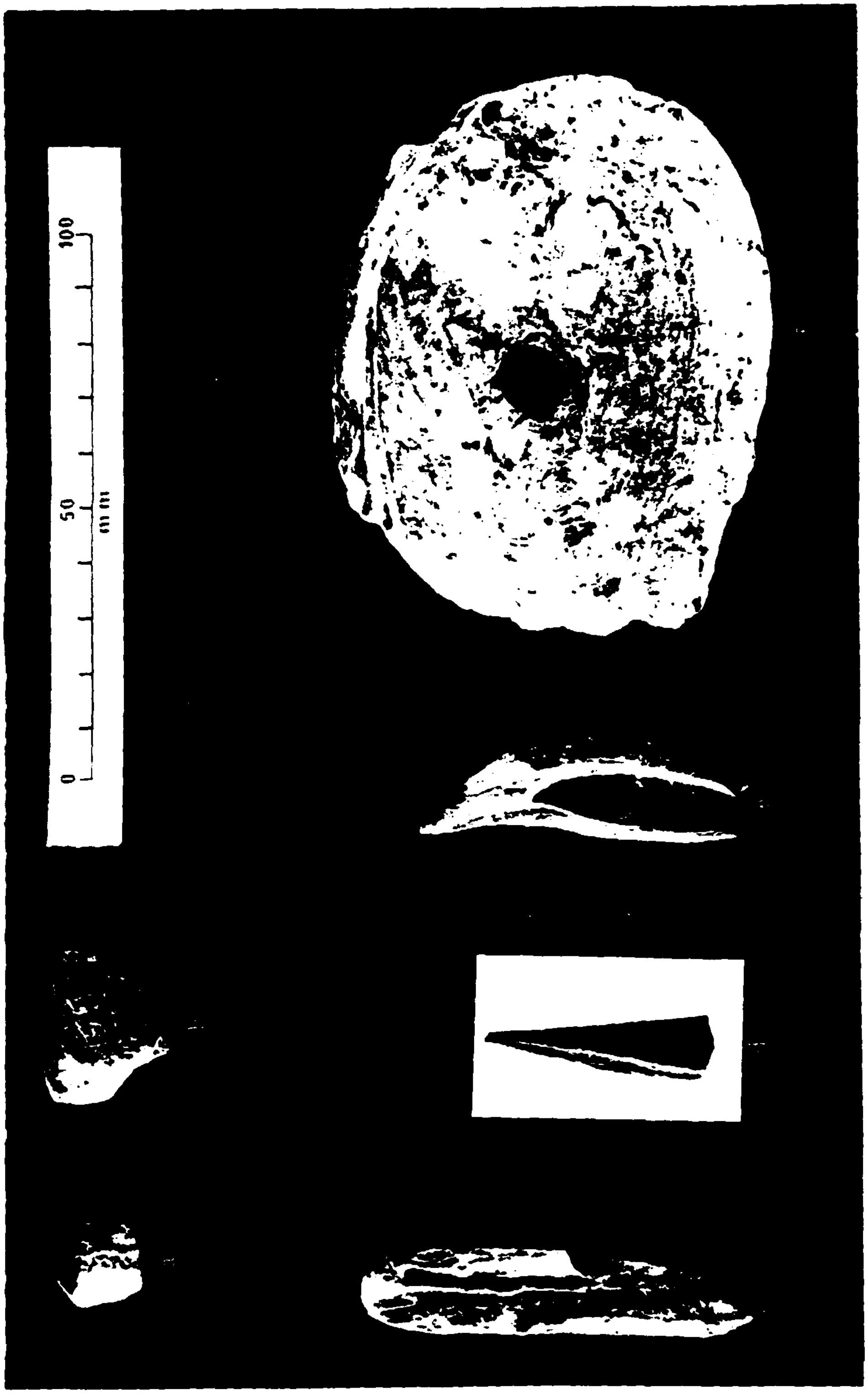

Figure 13-15. Ground hematite, bone, and shell artifacts. a-b. ground hematite; c. bone chisel; d. deer ulna awl; e. canine tooth pendant; f. shell hoe (AAS negative number 832785)

Anvilstones

Two specimens of tabular sandstone have either a single marred surface (Figure 13-13g) or is bipitted due to impact damage (Figure 13-13h), probably due to bipolar percussion cobble reduction. The two specimens have nearly identical size and weight. The larger of the two weighs 351.8 g and the smaller weighs 331 g. The surface area of most extensive marring or pitting is more centrally located than was true for the experimental quartzite anvil, which sustained its only true damage on an edge.

FINISHED TOOLS

The only general category of implements represented is heavy duty wood working petaloid celts or adzes, depending on the manner in which they were hafted. Four specimens are complete (Figure 13-14). An additional bit fragment (Figure 13-14e) and five spalls from the shaft of other specimens are part of our collection. One complete specimen is an unused preform (Figure 13-14b). Although all are traceable as stream cobbles, there are significant differences in material and concomitant manufacture technique which dichotomize the sample.

Diorite Celts

The two specimens are complete. One is a serviceable tool (Figure 13-14a), the other is a celt preform (Figure 13-14b). The preform is the larger of the two and has the original cobble surface on either end and the ventral side; its dimensions are: length, 93.6 mm; width, 40 mm; thickness, 29 mm; and its weight is 189.8 g. As noted from the dorsal side of the pole end, the initial shaping was by percussion hammmering which removed large spalls, followed by more careful pecking and finally grinding. The bit end was set up to take advantage of the natural cleavage of the cobble which is inclined about 50 degrees off the horizontal. Pecking and grinding of the dorsal face at the bit end resulted in a final (but unfinished) bit angle of about 95 degrees. The dorsal surface is thoroughly ground and is completely rounded; the transverse section of the preform is plano-concave. The manufacture procedure for the finished celt is identical, but resulted in a tool with a biplano transverse section, which probably mirrors the original tabular cobble shape. The finished tool is not as extensively ground on both surfaces as would be expected from the careful grinding of the preform's dorsal surface. The pole end is not modified in any obvious way, which is similar to the lack of preparation seen on the preform also. Dimensions are length, 84.8 mm; width, 40.4 mm; and thickness, 23.5 mm; it weighs 140.7 g and the bit angle is about 85 degrees.

The celt spalls are also of diorite and presumably came from other similar tools or preforms.

Chert Cobble Celts

Three specimens include two complete (Figure 13-14c, d) and one bit fragment (Figure 13-14e). These are all smaller than the diorite celts and evidence little care in manufacture beyond the bit preparation. The body of the celt is essentially unmodified from that of the original chert cobble, other than damage to the pole end. The latter is similar to impact damage of a hammer in the bipolar experiments which produced a bifacial edge on the anvil end of cobbles (Figure 13-4b, f). Probably the initial process of bit preparation was bifacial working by bipolar percussion technique. One specimen (Figure 13-14c) clearly shows these flake scars on the bit end; the other two do not and they have either been completely obscured by subsequent bit grinding, or grinding only was the process of bit preparation. Other than the care exercised in bit

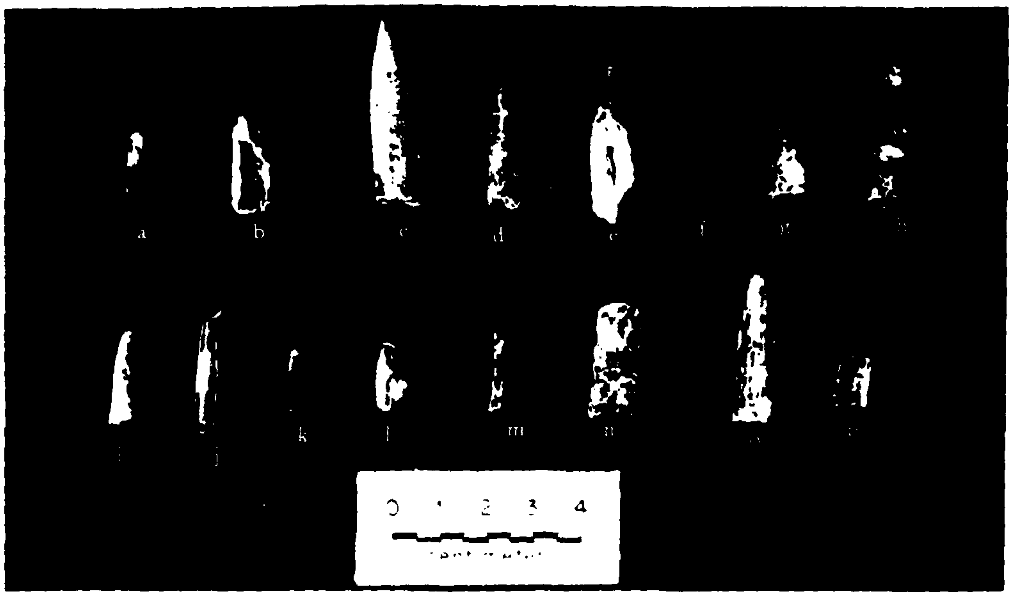

Figure 13-16. Antler tip tools. a. arrow point from west muck ditch in Backhoe Trench 1; b. arrow point from Levee Transect Unit 10; c. arrow point from Postmold 6; d-f. arrow points from Levee Transects Units 1 and 5; g-h. arrow points from Aboriginal Burials 7 and 12; i-n. antler tips from west muck ditch at south end of levee transect; o-p. arrow points from Aboriginal Burial 10. (AAS negative 822201)

manufacture, the only comparable effort was placed in selection of a nearly parallel sided, tabular cobble, which with little effort could be transformed into a celt. Of the complete specimens, the larger has dimensions: length, 62 mm; width, 24.6 mm; and thickness, 15.5 mm. It weighs 41.6 gm; and the bit angle is about 90 degrees. The other specimen has dimensions: length, 50.9 mm; width, 21.6 mm; and thickness, 6.5 mm. It weighs 13.4 gm; and the bit angle is about 42 degrees. The bit fragment weighs 5.5 g and its thickness of 7.8 mm indicates it was originally intermediate in size between the two complete specimens; its bit angle is about 80 degrees.

OTHER TECHNOLOGY PRODUCTS

Two pieces of hematite have been ground, probably for pigment production. The larger weighs 12.6 g, and has two ground facets (Figure 13-15b) and hardness on the Mohs scale of between 5 and 7. The other specimen (Figure 13-15a) is much redder in color and may have been heated, as described by Dragoo (1963:129-130), to bring out the color. Ground on two surfaces, the facets merge into one another rather than being discrete, as on the other specimen. It weighs 2.6 g and its Mohs scale hardness is less than 4.

BONE AND ANTLER

Although not exclusively found with the aboriginal burials, their bone and antler artifacts are especially conspicuous for both the relative quality of preservation and the fact that—in two instances—they form probable tool kits. The latter are discussed as such under the general heading of finished tools. Mortuary items of bone or antler are primarily finished tools. These along with bone or antler blanks, preforms, and expediency tools and other bone debris occur primarily in the midden samples.

ANTLER BLANKS OR EXPEDIENCY TOOLS

Ten fragmentary antler tines, four of which are calcined, constitute the sample. The largest is nearly 70 mm in length and at its base has a diameter of about 15 mm. Other than rodent gnawing and burning, there is no obvious evidence of damage to surfaces and tips beyond what is normal antler wear. Representative antler tips are illustrated in Figure 13-16i-n.

FINISHED TOOLS

Split Bone Chisel

The specimen (Figure 13-15c) is a longitudinal section of deer metacarpel with a carefully ground chisel bit. Overall dimensions are: length, 72.6 mm; width, 15.5 mm; and thickness, 8.7 mm. The bit is bifacially ground and slightly rounded in outline, with maximum breadth of 14 mm and 5.5 mm thickness. The bit angle is about 85 degrees, and is positioned such that the bit would clear a projecting ridge of bone on the interior surface. The specimen is from Levee Transect Unit 6.

Deer Ulna Awl

The specimen is a distal fragment of a calcined (fire hardened?) ulna (Figure 13-15d), and was ground to a needle-like tip, now missing. Its dimensions are length, 42 mm; maximum thickness, 5 mm; and basal width, 7 mm. It is from Levee Transect Unit 9.

Antler Projectile Points

Nine specimens comprise the sample, of which five came from three burials (two each from Burials 7 and 10; one from Burial 12), one came from postmold 6 near the levee transect and the remainder are from levee transect excavations. All of the points are manufactured in the same fashion: an antler tine was girdled, snapped, and its center hollowed out into a cone and its surface cut and ground to a needle tip. None shows evidence of fire hardening. Four are essentially complete, including three from Burials 7 and 10 and the Postmold 6 specimens. Their dimensions are presented in Table 13-4. Representative examples are shown in Figure 13-16 (a-h, o-p).

Knapping Tools

Two types of implements are represented, antler flakers and deer ulna punches, as initially described by Ahler and McMillan (1976:179). All are unburned. One antler flaker is probably unfinished but is so severely rodent gnawed that it is impossible to be sure; it is from Burial 14. Including this artifact, there are six antler flakers. Of these, one is from Feature 24, potential Caddo Structure 2. The others are from Burials 8 and 14, two adult males aged between 35 and 39 years which comprise a separate burial pair at the north end of the direct impact zone, well away from the proveniences of the other two antler flakers. The burial specimens are clustered with one or more of five ulna punches and were situated on or about the left arm of each burial; these form two individual knapping kits, probably for final percussion and pressure flaking. Representative examples are illustrated in Figure 13-17.

Use-wear noted is virtually identical to that seen on my own percussion and pressure flaking tools used experimentally in indirect percussion and pressure work. The similarities in tip diameter, overall size, proportions and use-wear characteristics for the antler flaker burial specimens leave little doubt that the two individuals were similarly engaged in indirect percussion knapping tasks; and when one considers the ulna punches, in pressure flaking as well. As a whole these are all utilitarian implements, which appear to have been buried with the individual who used them.

The antler flakers are all similar in appearance and manufacture technique. As with the antler points, each antler tine was girdled near the shaft and broken. The butt end, with the exception of the Burial 14 specimen, was flattened by grinding perpendicular to the tine shaft and the tip end is also ground flat, going in some cases into the inner cancelous tissue. Measurements for the specimens are in Table 13-5.

Five samples comprise the sample of ulna punches. One is from Burial 8 (Figure 13-17a); the others are from Burial 14 (Figure 13-17c-d; FSN1254d,e; 1255a,b). From the perspective of manufacture and use-life, the main

Table 13-4. Antler projectile point measurements

Specimen Number	Length (mm)	Basal Diameter (mm)	Cone Diameter (mm)	Cone Depth (mm)	Weight (g)
430	40.4	10.2	6.6	20	2.0
985	39.6	10.0	7.0	26	1.3
1123	38.5	8.6	5.4	15	1.5
1139	30.6	8.2	6.3	16	1.1

Table 13-5. Antler flaker measurements

Specimen Number	Length (mm)	Butt Breadth (mm)	Tip Diameter (mm)	Weight (g)
[illegible]	50.5	12.4	5.6	4.4
[illegible]	48.2	12.5	4.4	4.2
[illegible]	51.8		10.4	5.0
[illegible]	[illegible]	14.9	10.8	5.1
[illegible]	66.0	14.0		6.9

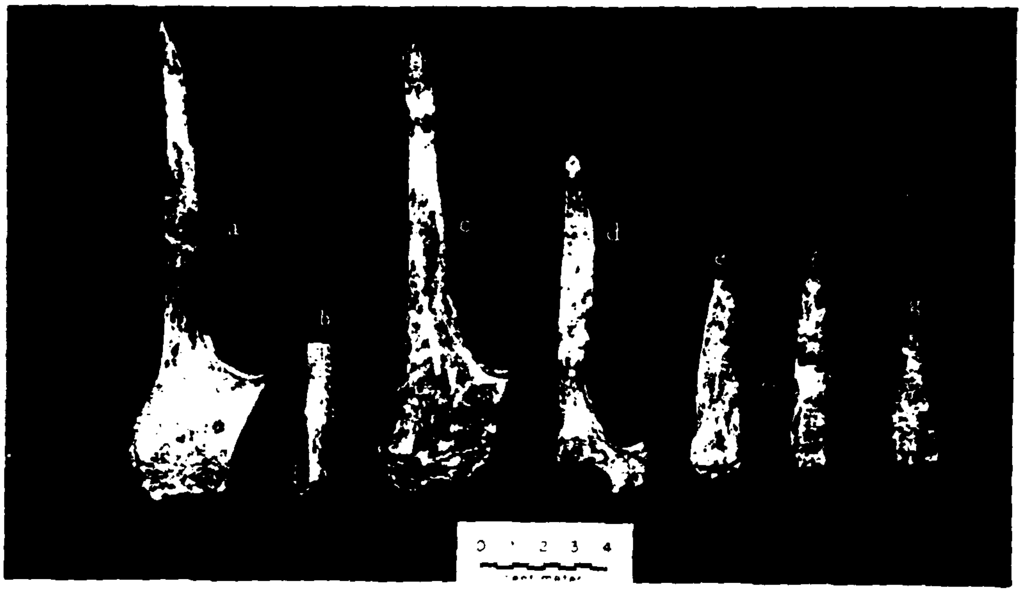

Figure 13-17. Bone tools from Aboriginal Burials 8 (a-b) and 14 (c-g) (AAS negative number 822206)

differences among the sample are due to the original size variation among the ulnas or to the crushing and removal prior to burial of the proximal epiphysis of FSN 1254e. Burial 14 specimens are equally divided between right (FSN 1254d, 1255a) and left (FSN 1254e, 1255b) elements. Burial 8's specimen is a right ulna. The size of the proximal end of each ulna varies substantially among the sample; it is most likely that the ulnas came from five individual deer. All of the ulnas for which an observation could be made (that is, excluding FSN 1254e) have fused proximal epiphyses and would have been older than 19 months when killed, as determined from modern comparative aging studies (Purdue n.d.:Figure 3) and assuming *the species is O. virginianus.* The primary modification was the snapping and grinding of the diaphysis, creating a blunt pointed instrument hand-held by the proximal end. It is impossible to judge how often, or if, the punches were resharpened by subsequent grinding but FSN 1254d is use damaged. Its tip is laterally exfoliated. Postburial alteration includes rodent gnawing of all but FSN 1255a. FSN 1255b was damaged in excavation, resulting in the partial breakage of the proximal epiphysis. Table 13-6 summarizes measurements.

Ornaments

Ornaments are of two kinds, represented by three artifacts. The first is a large canine tooth pendant, which on the basis of its size is most likely bear (Ursus sp.). This specimen (Figure 13-15e) is longitudinally split below the tooth crown on the lingual side and is notched at the tip of the root. Suspension would have been either by wrapping cordage or a leather strip about this notch or, if

Table 13-6. Ulna punch measurements

Specimen Number*	Total Length (mm)	Proximal Breadth (mm)	Diaphysis Length+(mm)	Punch Breadth (mm)	Weight (g)
770	156	40.5	87.6	10.4	25.1
1254d	149	38.3	79.6	11.5	21.1
1254e		33.0	68.6	10.0	17.7
1255a	165	41.8	90.0	10.7	34.8
1255b	119+	33.0	59.0	10.0	12.5

*measured where proximal radius would articulate
+end of articulating spine with proximal radius to punch tip

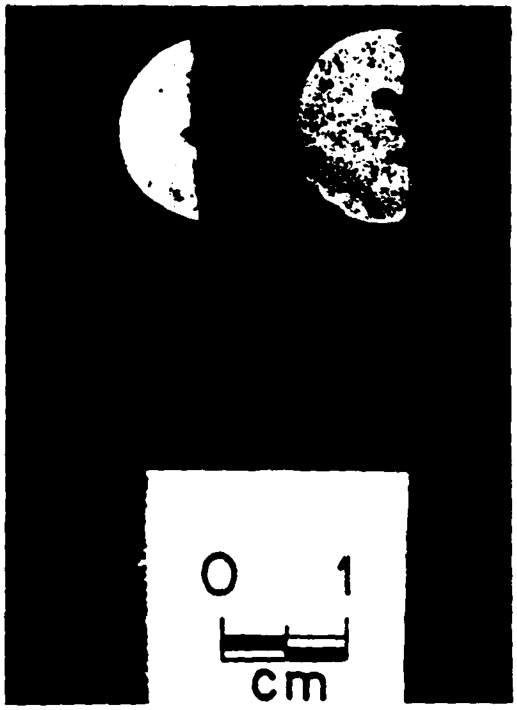

Figure 13-18. Bone buttons from Aboriginal Burial 9 (AAS negative number 815672)

the notch was originally part of an enclosed eye, threading cordage or a leather thong through it. Its length is 58.6 mm and weighs 5.5 g. The specimen was excavated from Postmold [illegible], part of Feature 18.

The second kind is perforated bone disc, represented by two fragmentary specimens retrieved from the heavy float fraction of Burial 9. Burial 9 is a male in excess of 50 years age at death, chronologically the senior male represented by the Caddo burial population. The specimens are illustrated in Figure 13-18. Both are ground on the edges and both faces and their original shape must have been nearly circular. They are both split across the perforations, which were fashioned in the same way by drilling connecting holes from each side. The larger fragment is about 1 mm thick, has a measurable diameter of 16.3 mm, and two perforations 6.4 mm apart in the approximate center of the disc. Maximum perforation diameter is 2.5 mm, narrowing to about 1 mm at the center. The other disc fragment has a length along the break of 15 mm, maximum breadth of 6.3 mm, and thickness of 1.0 mm. The perforation is centrally located along the break but too much is missing for accurate measurement—nevertheless, it is probably not greatly different from the two on the other specimen. Originally, both specimens were approximately the same shape and had a radius of about 8 mm, as determined by placing the specimens on a set of concentric arcs. Whether the small fragment initially had multiple perforations cannot be determined, nor can it be said that the larger specimen originally had but two perforations.

Trubowitz (Chapter 18) interprets these items as bone buttons which were fashioned after European buttons, and regards them as evidence of culture contact. If so, it might be anything from stimulus diffusion to actual exchange. I think it is premature, however, to place either a functional label on these items or to interpret them as evidence of European culture contact. The specimens are simply too fragmentary to be assigned functionally with any assurance beyond the general use as probable ornaments. In addition the manufacture of perforated discs of ground bone and shell is not at all unusual among the precontact Indians of the southeastern United States. In fact, several artifacts of this type of bone and with multiple perforations were recently excavated at the Toltec site, near Little Rock, Arkansas, and are on display at the Toltec Visitor Center. These are undoubtedly older than the Caddo V context of the Cedar Grove artifacts. From Cedar Grove itself have come perforated discs of ground shell from another burial. Their position indicates attachment at the ear, and thus, they are not similarly interpreted as potential buttons. The lack of exact context for the bone discs further makes any functional designation tenuous.

SHELL

All shell artifacts are from mortuary contexts associated with Burials 3, 4, 5, 6, 7, 9, and 10 and are finished tools and other technological products. To one degree or another their surfaces are stained or have a brown residue, and are pocked. This is assumed to be the result of postdepositional chemical alteration. Conch shell ornaments and a cup comprise the majority; included in the sample also is a freshwater mussel shell hoe, found with Burial 4.

Unmodified mussel shells which contained other mortuary artifacts, however, are not included in the artifact sample. Technically, the latter would probably be shell expediency tools. The ornaments constitute several discrete types, to include necklaces of beads or pendants, bead bracelets, and ear discs or pendants. The necklaces from Burials 5 and 7 and ear pendants from Burials 6 and 9 are identical in form. The other ornaments are unique items, or are burial specific.

BEAD NECKLACES

Burial 3

A single necklace is represented by 83 whole disc beads as originally strung together with similar specimens which it was not possible to string in their original order (Figure 13-19); the total counted at time of excavation was 123. The beads are approximately the same size and shape, and most appear to have been manufactured by drilling into the side of a conch shell with a hollow nosed, circular drill--perhaps a circular reed or cane with sand as an abrasive. The beads are mostly drilled from one side, creating a truncated cone perforation in the center of the bead. Measured at random, one of the beads has a diameter of 8 mm, is 3 mm thick, with a perforation diameter of 4 mm at the base and 3 mm at the top; it weighs almost 0.2 g.

Burial 4

Four massive, flat-ended conch columella beads constituted a necklace for Burial 4. The four are illustrated (Figure 13-20c) and vary in weight from 13.5 g to 17.2 gm; total weight is 60 g. The beads are ground carefully and have a rounded but not circular appearance. Depending on the curvature or contour of the columella, the beads have triangular to "S"-shape sections. They vary in length from 23.7 mm to 32 mm, in width from 23.5 mm to 25 mm, and in breadth from 16 mm to 18 mm.

Burials 5 and 7

Two conch columella necklaces were recovered (Figure 13-21). The one from Burial 5 is of eight large beads, one which was recovered from the flotation of the burial fill from the cervical vertebra. The beads are tubular, between

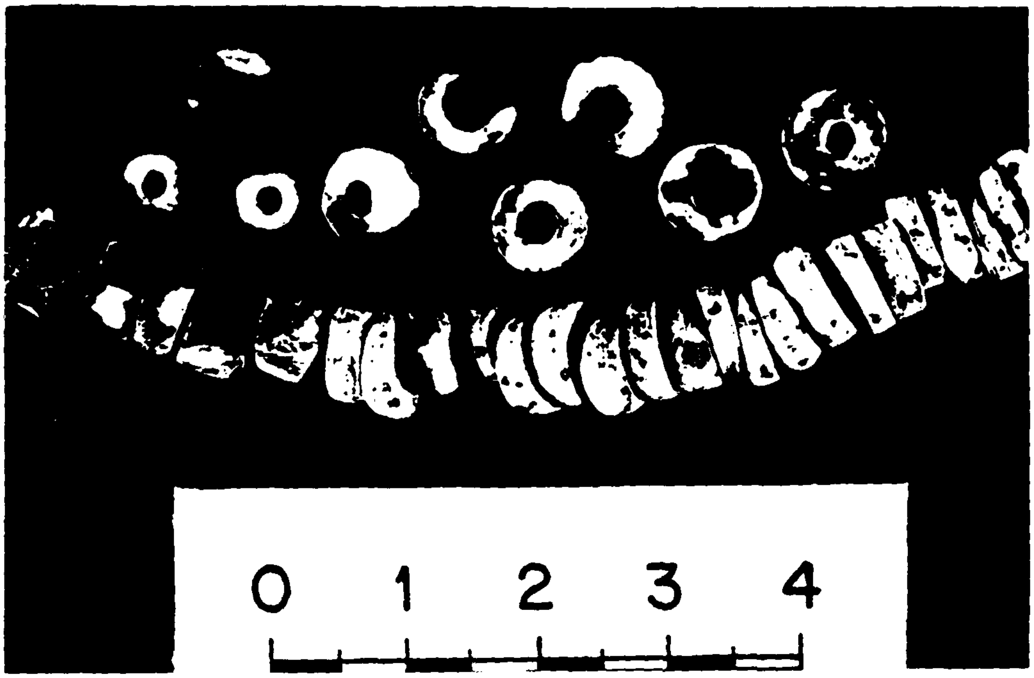

Figure 13-19. Disc bead necklace in situ on Aboriginal Burial 3 (AAS negative number 822202)

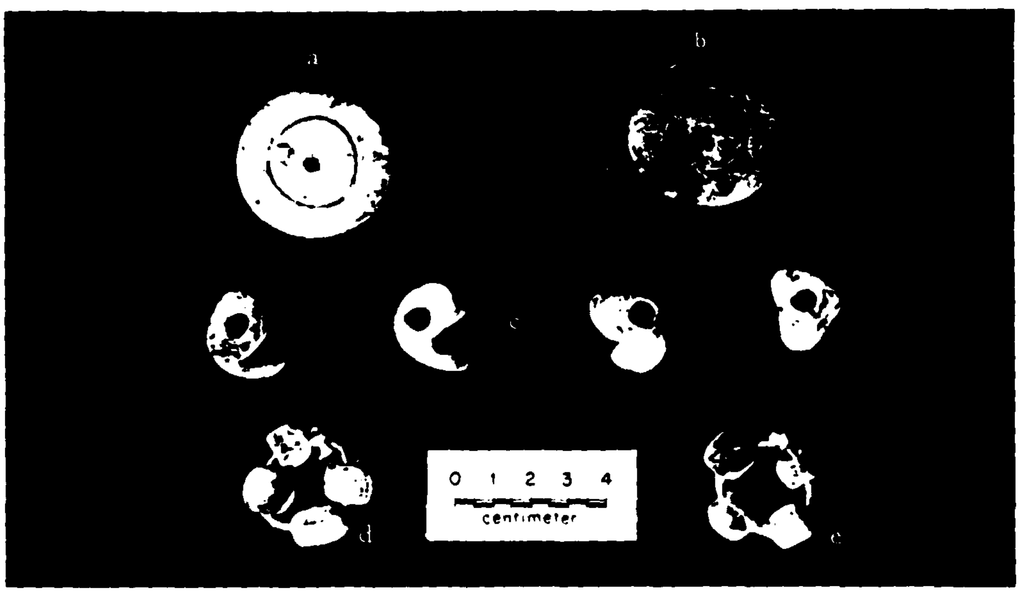

Figure 13-20. Shell ornaments from Aboriginal Burial 4. a-b. ear discs; c. conch shell necklace; d-e. conch shell bracelets (AAS negative number 822207)

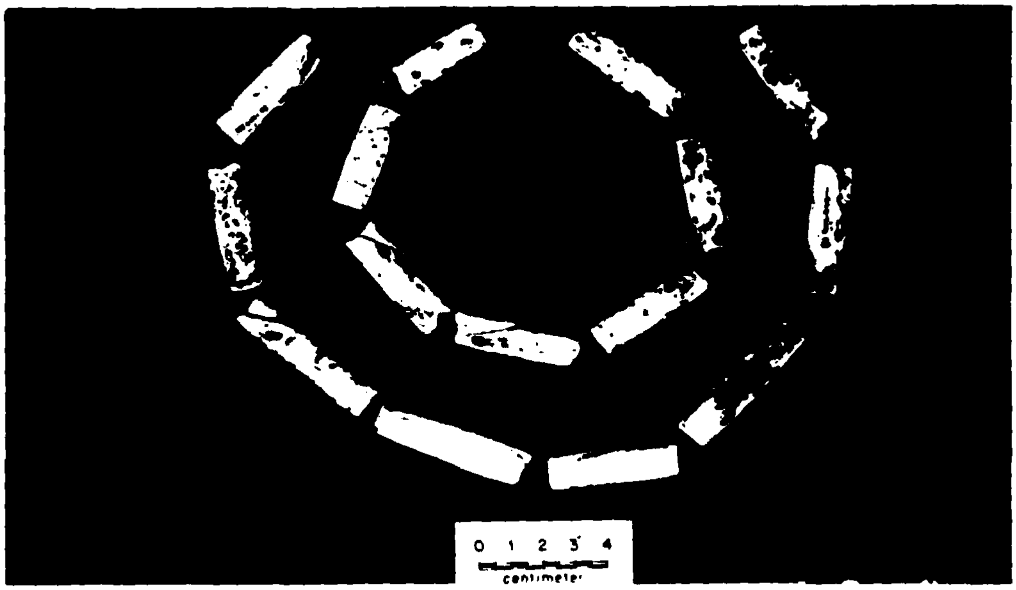

Figure 13-21. Tubular conch shell necklaces. Inner necklace from Burial 7; outer necklace from Burial 5 (AAS negative number 822204)

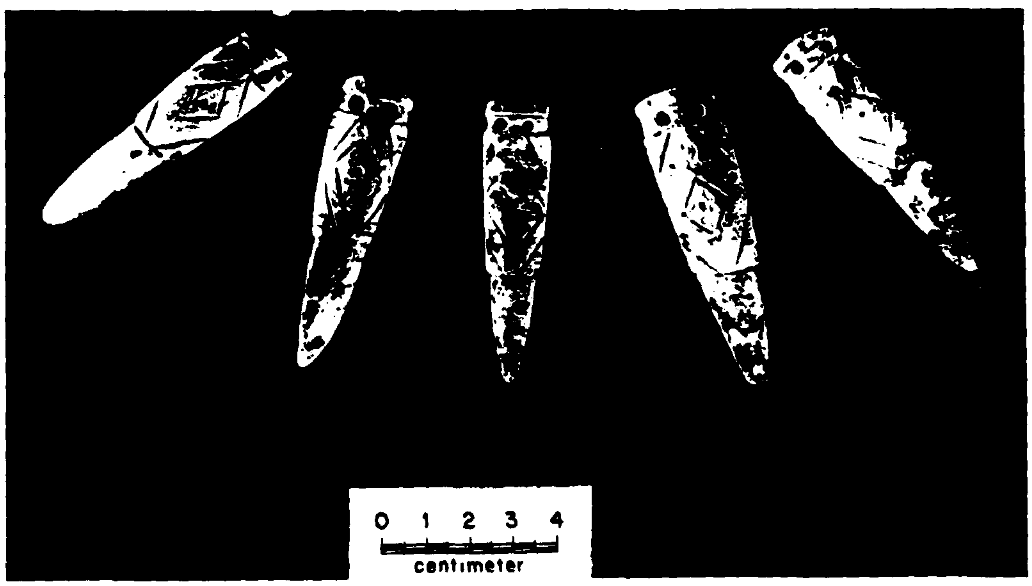

Figure 13-22. Conch shell pendants (in order) from Aboriginal Burial 10 (AAS negative number 815673)

11 and 13 mm in width, vary in length from 40 mm to 49.8 mm and are drilled from both ends; the perforation is usually between 4.5 mm and 5.5 mm in diameter. Total weight is about 76 g. The Burial 7 necklace weighs about 56 g and contains seven tubular beads, which in form are identical to the Burial 5 necklace. Bead width varies from 11 to 13.5 mm; length, 30.5 to 40 mm; perforation diameter, 4.5 to 55 mm. The necklace is illustrated as it was uncovered in Figure 10-7.

ZOOMORPHIC PENDANT NECKLACE

The most intricate and interesting ornament is the Burial 10 pendant necklace (Figures 13-22). Each of the five pendants are carved from the curving wall of the conch shell, are geometrically engraved with a zoomorphic figure whose two eyes are perforated and serve as the points of attachment for the necklace. The pendant form is straight sided with a rounded tip opposite the eyes. At the eye level is a small indentation of the pendant lateral edges, followed by an almost parallel sided body set off from the head and tail by zone engraving. The tail constricts to the rounded tip below the zoned engraved body. The eyes are set off from the body by single horizontal lines above and below, and the same approach is taken to delimit the tail from the body. Within the horizontal zoned lines of the body is a central pit, partially drilled into the body of the pendant and about which are two concentric diamonds, the larger of which terminates at either end (at the zoned engraved lines) and on either side; the inner diamond only is complete. The outer diamond and the horizontal zoned lines divide the body into four roughly equal outer body areas, where pairs of parallel lines were carved from the pendant wall to almost the edge of the outer diamond. These sets of parallel lines are reasonably interpreted as either representing a four or eight legged figure, and are clearly visible on three pendants. The tail does not appear to have been either as carefully or at all engraved; one specimen has a very faint diagonal line which may have been one side of an inverted chevron. Depending on the amount of original shell curvature, the interior of the pendant at either the head, tail, or both ends is horizontally ground as well. This would have affected orientation of the pendants when suspended at the neck. The pendants range in length from 66.8 mm to 76.7 mm; width, from 15.8 mm to 19.2 mm; and thickness, 2.4 mm to 4.5 mm. Weight varies from 4.7 g to 10.5 g. The eye holes vary from a minimum of 3.1 mm to a maximum of 5 mm at the upper surface, narrowing to between 2 mm and 3 mm in the interior; they are drilled from both faces. Three of the pendants also have paired sets of punctations drilled above the eyes which do not exceed the diameters of the central body punctation; the maximum diameter is 1.3 mm.

As described by Webb (1959:172-173), similar zoomorphic forms are noted at several Caddo sites and are interpreted as lizard-effigy pendants, although it is possible that an insect (or more appropriately, a spider) might as well be represented. Sites where similar items occur include the Foster, Friday, Battle Mound in Arkansas, and Belcher mounds in Louisiana, all on the Red River and at two sites in east Texas—Winterbauer and Clements.

Four specimens from Belcher Burial 5 (Webb 1959:170-172, Figures 62, 131) are virtually identical to the five Cedar Grove pendants. They form the center of a necklace of 18 pendants, all similar lizard-effigy forms but perforated laterally at the neck instead of being "drilled anterioro-posteriorly with two holes which suggest eyes." Spaced between these laterally drilled pendants are small tubular conch columella beads.

Only the addition of the laterally drilled pendants and the small tubular beads spaced between them differentiate this necklace from the one at Cedar Grove. It appears that the central element of either necklace is for either decorative or symbolic reasons clearly focused onto the "eyed" pendants. The similarity is so striking it begs for a more systematic description and analysis of the pendants than either Webb or I can provide separately.

BRACELETS

Two bracelets of four barrel-shaped conch columella beads each were found at either wrist of Burial 4. Bead manufacture is no different than for the larger tubular conch columella beads, other than that the ends are ground round rather than flat. For the right bracelet bead dimensions vary in length from 9.2 mm to 12.3 mm, in diameter from 9 mm to 11.8 mm, and with perforation diameters between 3.5 mm and 4.6 mm; the bracelet weighs about 6 g. Dimensions for the left bracelet beads vary in length from 9.6 mm to 14 mm, in diameter from 10.5 mm to 13. 6 mm, and with perforation diameters between 3.3 mm and 4 mm; the bracelet weighs about 7.5 g. The two bracelets are illustrated (Figure 13-20d, e).

EAR DISCS

From either ear of Burial 4 was a centrally perforated, conch shell disc. The two are virtually identical and are illustrated (Figure 13-20a, b). The left disc is just slightly larger than the right, with respective diameters of 41 mm and 40.6 mm. Both have a single engraved circle concentric with the central perforation on the outer surface. This circle has a diameter of 24 mm for the left disc and 22.5 mm for the right one. The central perforation is drilled from both faces, going from 4.5 mm to 2.4 mm on the left disc and 3.2 mm to 2.4 mm on the right. Thickness is about 3 mm for both specimens. The larger weighs 8.6 gm; the smaller, 4.8 gm.

EAR PENDANTS

Two sets of similar shaped pendants came from the ear areas of Burials 6 and 9. The larger pair is from Burial 6; all four are illustrated (Figure 13-23). The pendants are bipointed, ground sections of conch columella, perforated from two sides at one end for attachment. Burial 9 specimens are about 51 mm long and 11 mm in diameter at the center; perforation sizes are between 4 mm and 4.6 mm in diameter; and weights are 7.6 g and 8.1 g. Burial 6 specimens have almost a machine-tooled quality; their dimensions are, respectively: length, 64.3 mm each; width, 13.6 mm and 13.5 mm; breadth, 9.5 mm and 10.6 mm perforation diameter on exterior, 3.6 mm and 3.5 mm; and weight, 11.5 g and 12 g.

PERFORATED SHELL HOE

The specimen is from Burial 4 (Figure 10-4f) and is a left valve of Megalonais gigantea, a freshwater pelecypod common to large rivers of the eastern United States (Parmalee 1967:33). Other than the roughly circular perforation, which originates from the exterior surface of the approximate center of the valve, attrition to the ventral margin, probably due to use, and erosion of the umbo, there is no obvious modification of the shell. It was damaged on the posterior margin in excavation or shipment, however. The perforation is about 14 mm in diameter and was struck by a single percussion blow to the shell exterior. The artifact weighs about 86 g, measures from the hinge line to the ventral margin 79 mm and from the anterior to the posterior margin over 100 mm. Thickness at the ventral margin is about 1 mm. The specimen is illustrated in Figure 13-15f.

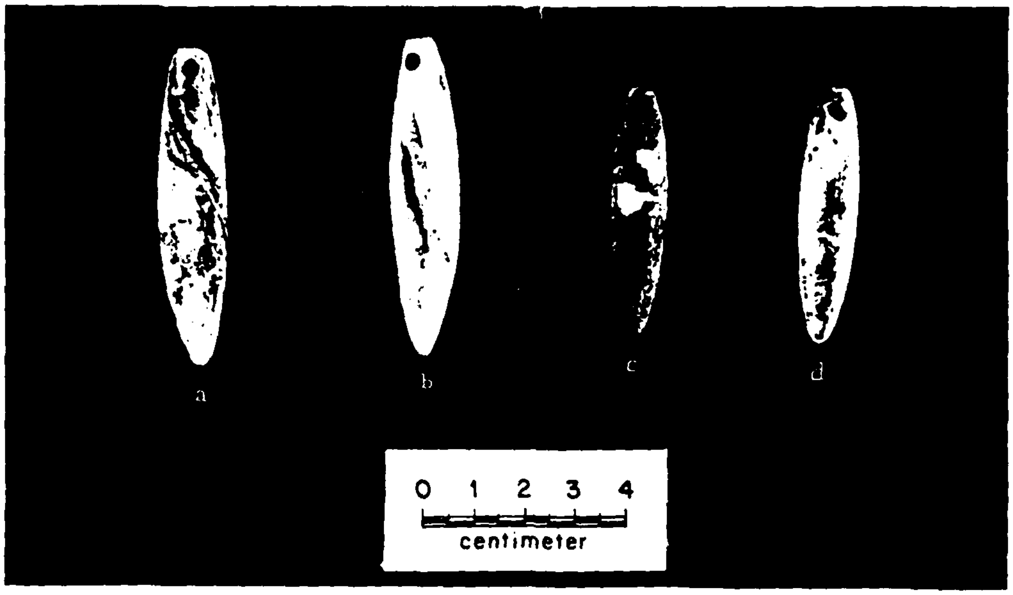

Figure 13-23. Ear pendants from Aboriginal Burials 6 (a-b) and 9 (c-d) (AAS negative number 822205)

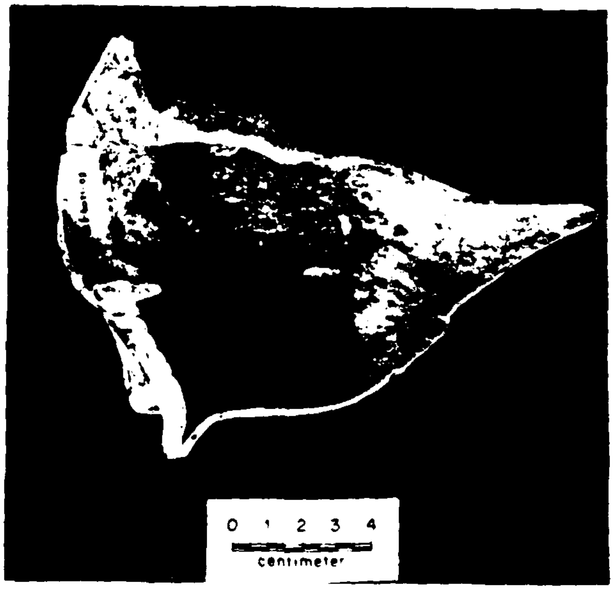

Figure 13-24. Interior of conch shell cup from Aboriginal Burial 7 (AAS negative number 815674)

CONCH SHELL CUP

From Burial 7 came the sole example of this type (Figures 13-7b, 13-24). The specimen weighs 222.2 g, has a crown diameter of 110 mm and a standing height of 165 mm. The inner surface has a black to dark brown residue in the deeper part of the bowl. The specimen is poorly or haphazardly manufactured and shows little of the skill or care in execution one normally associates with similar items from other Caddo mortuary contexts. Other than a faulty attempt to remove the crown from about the columella, there is no engraving—and in this case, it is strictly an optional modification during cup manufacture. The projecting crown spines have not been removed and manifest little evidence of purposeful smoothing or grinding. Columella removal was not fully completed; projecting into the cup interior is its torn or jagged edge. There are no perforations and the cup was apparently neither suspended nor hung in this fashion, if at all.

II. SENTELL ARTIFACT DESCRIPTIONS

CHIPPED STONE

DEBITAGE

There is nothing strikingly different in the lithic debitage, relative to that of Cedar Grove. It is dominated by bipolar percussion lithic debris including cores, flakes, and shatter which would be indistinguishable from the Cedar Grove collection. The only thing that may be unusual is a single flake struck from a clear quartz crystal, the second artifact of this material from either site. The flake is small and weighs 0.6 g. The other quartz crystal artifact is a notched point preform, also from Sentell.

PREFORMS

Five preforms are complete, 4 are basal fragments and seven biface segments may have come from either preforms or finished bifacial tools. The complete preforms are all bipolar chert cobble flakes which have been bifacially flaked to a greater or lesser degree, other than the quartz crystal item which is either side or corner notched. The others are unnotched and either triangular or roughly ovate in

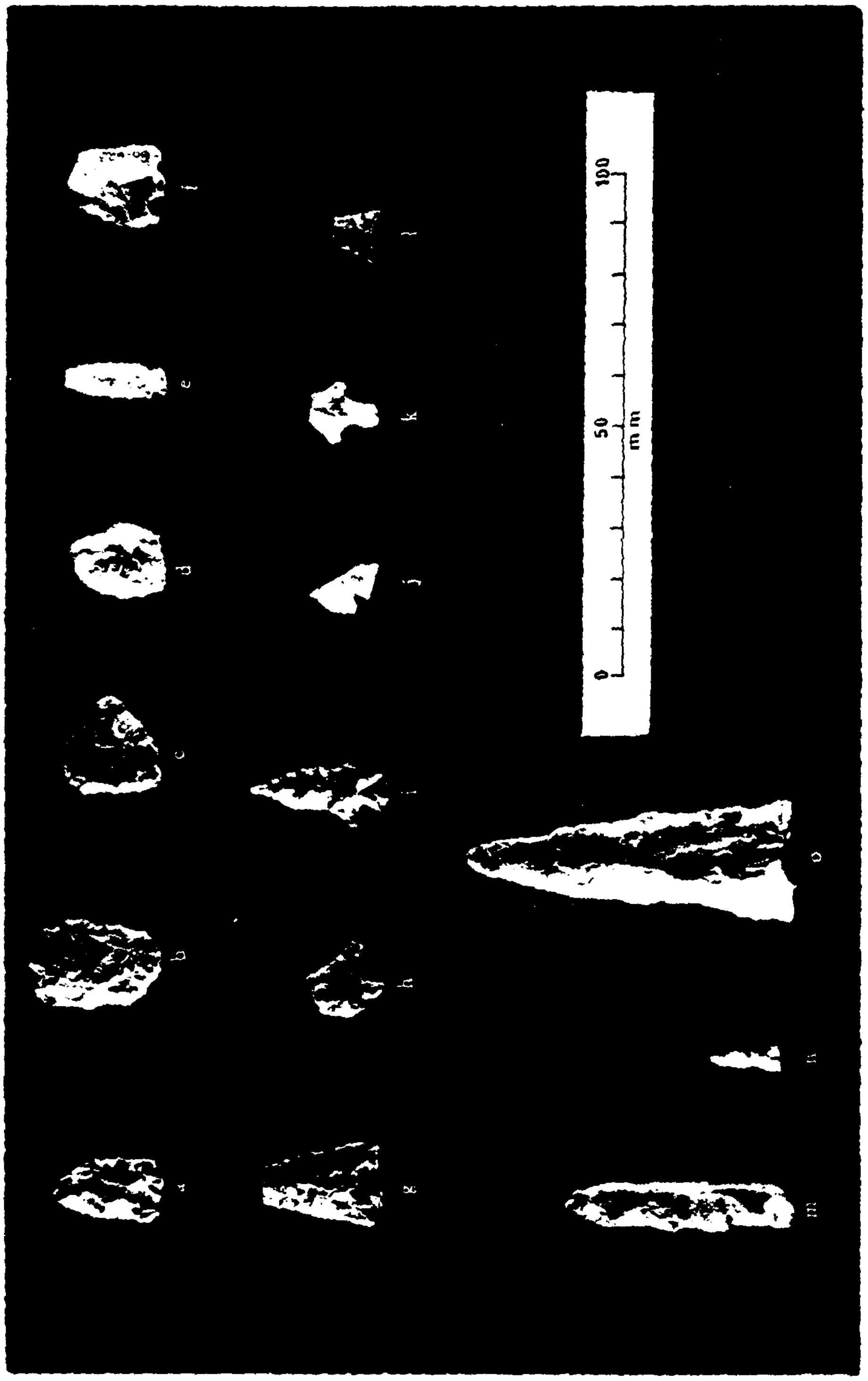

Figure 13-25. Sentell chipped stone artifacts. a-f, preforms; g, Fresno; h, Bassett point base; i-l, Scallorn; m-o, perforators (AAS negative number 832786)

Table 13-7. Whole preform measurements

Specimen Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
178a	23.0	13.0	5.4	1.3
178b	27.0	18.6	4.7	2.2
180c	19.3	15.2	5.0	1.5
181d	19.6	19.6	5.1	1.8
184e	20.5	7.3	3.4	0.6

shape. The basal fragments are also triangular or ovate, and one was in the process of being notched when discarded or lost. Two segments are probably from contracting stemmed bifaces but both are heat fractured and it is not possible to be more precise. Heat fracture is also evident on one basal fragment as well. Representative specimens are illustrated (Figure 13-25a-f). Dimensions of the whole specimens are in Table 13-7.

FINISHED TOOLS

Arrow Points

Fresno. One specimen (Figure 13-25g) is tentatively classed. It is pressure flaked and is minus the tip. The base is fairly straight but has a distal hinge fracture on one face which may indicate former presence of a stemmed haft. In any case, the item is 17 mm wide, 3 mm thick and would have been longer than 25 mm; it weighs 1.8 g. It is from Stratum 6/7/8.

Bassett. The specimen (Figure 13-25h) is from Stratum 7 and is heat fractured. Its weight is 0.5 g and thickness is 3.2 mm. The blade edges are finely serrated, the left basal ear and much of the tang and the blade are missing; however, there is enough of the tang and the characteristic basal concavity to unequivocally classify the specimen.

Scallorn. One complete (Figure 13-25i), three (Figure 13-25j-l) basal and one tip fragments comprise the sample. Two are from the surface, one from Stratum 7 and two from Stratum 6/7/8. The complete specimen is a surface find and measures 23 mm long, 13.4 mm wide and 4 mm thick; it weighs 1 g. The second surface find is simply a notched flake with marginal pressure retouch (Figure 13-25j), similar to specimens from Cedar Grove (Figure 13-10f-g).

Perforators. Three bifaces (Figure 13-25m-o) comprise the sample. Only one is complete but it shows no macroscopic evidence of wear. It is a bifacially worked bipolar flake 46 mm long, 12 mm wide, 9 mm thick, weighing 4.2 g. One fragment is a tip 10.4 mm wide, 7.2 mm thick, and weighing 0.8 g. The other is 25 mm wide, 13.3 mm thick, weighs 16.7 g and has a measurable length of 67.4 mm. Its tip is extensively rounded and ground due to use. Breakage of the last specimen is due to heat fracture; the other fragment probably sustained a use related break. The complete specimen and the small fragment are from Stratum 7; the larger fragment (of novaculite) is from Stratum 8, Postmold 5.

GROUND STONE

BLANK

An unmodified lump of hematite, weighing 12.6 g, constitutes the only item of this type. It is from mixed Strata 6/7/8.

EXPEDIENCY TOOLS

Hammerstone

A single quartzite cobble hammerstone is present. It is egg shaped and weighs 186.3 g, with a length of 84.4 mm, 39 mm width and 34.5 mm breadth. The item is from the surface.

Ground Slabs

Two small sandstone slab fragments comprise the sample. One is a surface find with grinding on two adjacent surfaces, it weighs 3.2 g. The other is ground on opposing surfaces, weighs 5.2 g, and is from Stratum 7. Both specimens have hematite residue adhering to the ground surfaces.

RESULTS

INTRASITE COMPARISONS

For Sentell the major typological results of this study are at some variance from the previous assessment (Trubowitz and Schambach 1982:28). Two contracting stemmed biface fragments had previously been identified as a possible Gary point (Trubowitz and Schambach 1982:Figure 19a) and a graver on a reworked biface (Trubowitz and Schambach 1982:Figure 20i); both are noted here as too fragmentary for typological assessment and the one classed previously as a graver is simply a heat fractured segment with a jagged edge, not a graver. The corner notched arrow points are listed by Trubowitz as Alba and Scallorn points. This may be defensible in a strict application of Caddo point typology, but it should be noted that their Scallorn example is an unfinished preform, while the Alba point may well be another example of basal recycling, as described for Cedar Grove. What is classed by Trubowitz as a broken Haskell point is nothing more than a misoriented basal Bassett point fragment. The prior conclusion that the Alba, Scallorn, and Gary points denote a Caddo I/II component, thus, receives little support from this study. The presence of this component is supportable only from Schambach's ceramic analysis. The lithics from Sentell are compatible with Cedar Grove in virtually all technological and stylistic details, and presumably in time also.

The Cedar Grove subtractive technology presents other analytical opportunities. Its technological analysis allows for the derivation of specific manufacture and use-life models for stone artifacts (Figures 13-26 to 13-28), the identification of a typologically distinctive late Caddo assemblage, and within this assemblage functional differentiation by material and context.

The mortuary context of some of the bone, stone, and shell items are to one degree or another testimony of sexually linked artifacts or tool kits, assuming the Cedar Grove mortuary practices are similar to Caddo ethnographic examples (Swanton 1942:203-210). Perhaps the best example is the flintknapping tool kits--the antler flakers and deer ulna punches--found with Burials 8 and 14, both 35-39 year

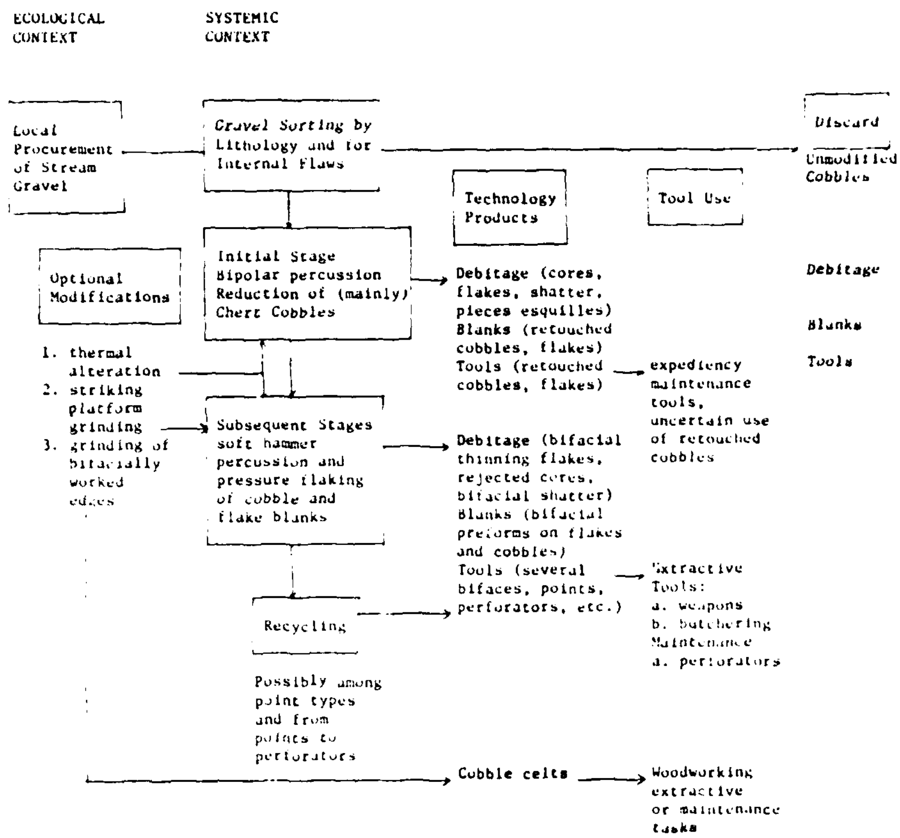

Figure 13-26. *Chipped stone tool production model for Cedar Grove*

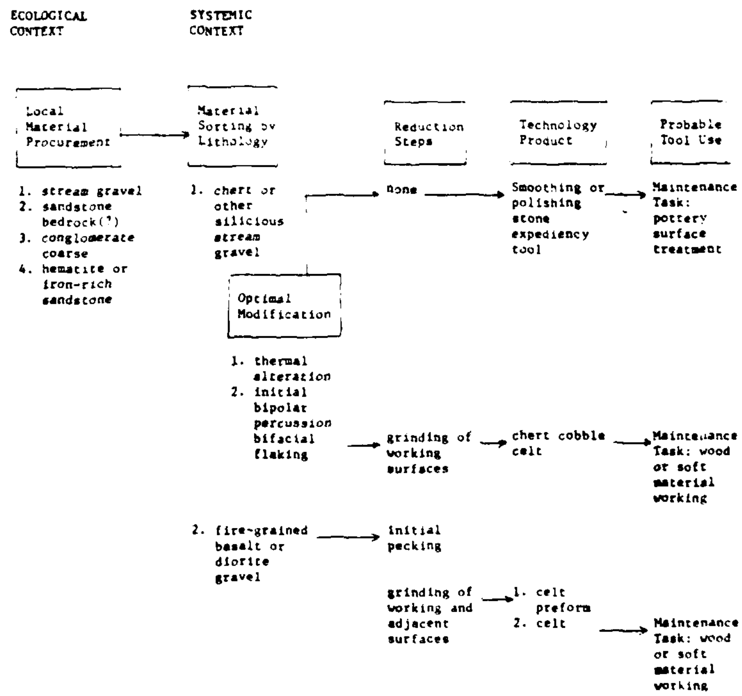

Figure 13-27. Ground stone tool production model for Cedar Grove

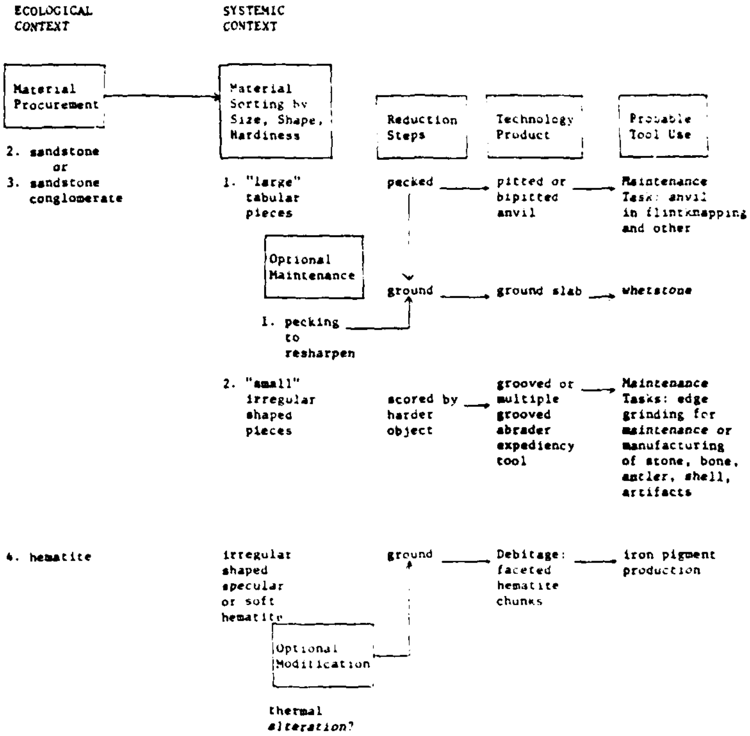

Figure 13-28. Ground stone tool production model for Cedar Grove

old males that comprise Burial Group E. The presence of socketed antler projectile points also occurs with adult males (Burials 7, 12) and an unsexed adolescent (Burial 10). Both Burials 7 and 10 have similar placement of these points, along the left leg with the tip facing the feet (Figures 10-7f and 10-10a); both burials are from Burial Group C. In contrast, the socketed antler point from Burial 12 is about the right wrist (Figure 10-13c) and two chipped stone points (Maud and Scallorn) are along the left upper arm (Figure 10-13a-b). The third chipped stone projectile, the Bassett point, is in the center chest below the throat of Burial 14, one of the males with the flintknapping tools. The occurrence of both chipped stone and socketed antler points is highly suggestive of male ownership in this instance. The single shell hoe was at the feet of an adult female (Figure 10-4f), Burial 4 from Burial Group C. Shell ornaments also appear to reflect sexual differences in occurrence which will be further assessed.

The manufacture and use-life models are self-explanatory. And they follow as particular examples of our general subtractive technology model. Perhaps the main thing that should be emphasized is the primacy in stone tool production of both the local acquisition of raw materials and the initial reduction of stream cobbles by bipolar percussion techniques. The major cultural implication is that the Cedar Grove inhabitants were self-sufficient in acquiring ground and chipped stone resources and in their technological modification.

The Cedar Grove collection contains a large assortment of typologically distinctive artifacts. Given their context in either the midden or aboriginal burials, it is reasonable to infer that these items functioned within a single community over a short period of time. To one degree or another the artifacts are chronologically sensitive. Among the chipped stone items are the Maud, Bassett, Nodena, and Scallorn arrow points. Even given the probability of optional maintenance and recycling, these four types appear to be the most sensitive chipped stone stylistic indicators of the late Caddo component. The ground stone celts may be equally valid stylistic indicators as would many of the finished tools of bone--especially, the bone chisel, antler projectile points, knapping tools, canine tooth pendants and perforated discs--or shell ornaments. Of the latter, the zoomorphic pendants are without question the most significant stylistic indicator of stone, bone, or shell.

Functional differentiation of the expediency and other technological products is possible to at least a minimal degree. Binford's (1962) distinctions of technomic (or purely utilitarian), sociotechnic (mainly items denoting social status, or role) and ideotechnic (artifacts of a symbolic, or even metaphysical nature) bear on this analysis, although it will not be possible to assign with equal clarity Cedar Grove artifacts to one or another of these functional classes. The further dichotomy of technomic items into extractive (tools used in procuring biotic and abiotic resources, weapons) and maintenance (tools used to shape or otherwise maintain other artifacts, and to process food) functions (Binford and Binford 1966) also applies to this analysis as a general guide.

The majority of stone and bone tools from Cedar Grove is unambiguously classed as utilitarian, or technomic artifacts which have clear extractive or maintenance functions. Extractive items of stone are the arrow points (or armatures), and celts (heavy duty wood working). The only unambiguous bone extractive tool is the antler projectile points (or armatures). Maintenance functions are inferred for the stone engraving or wood working tools (the graver and possible burin), perforators, hammer and anvilstones (primarily, bipolar percussion work), ground slabs and abraders (stone tool grinding, vegetal food and mineral

processing, maintenance and resharpening of bone, antler, wood, and shell tools), and polished cobbles (pottery burnishing). Similar maintenance functions are ascribed for bone artifacts, especially for the various flintknapping tools (antler flakers, ulna punches), the bone awl (hide working, clothing manufacture) and chisel (animal and vegetal processing).

It is difficult to believe that this represents the sum total of maintenance and extractive tasks of the Cedar Grove inhabitants. Far more likely is that this reconstruction addresses only those tasks which have a reasonable chance of being partially preserved in the archeological record...to this we must add house construction and burial pit preparation, which are directly observed at the site, and various food collection and producing activities as well as fire maintenance, for which we have either direct or indirect evidence. Although not preserved, it is plausible that the technological base of Cedar Grove drew as much from perishable artifacts of wood, fiber, and leather as it did from the few items of stone, bone or antler, and shell which have been preserved.

The Caddo ethnographic record bears this out. Indeed, much of the manufactured goods probably would not have preserved, as they were made of wood, hide, textiles, feathers, carved cane, or reeds. Swanton (1942:154-159) discusses these items and their function in some detail. With respect to some of the critical subsistence activities, it is most likely that implements of wood such as mortars and pestles for making corn flour were used, as were wooden hoes of walnut or seasoned hickory. Wood tongs were used to move burning coals; fires were started by twirling firesticks of cedar and mulberry against a piece of dry moss. Musical instruments such as flutes, or flageolets, were fashioned from reeds, carved cane, or heron bones, while gourds were used as rattles or as drums. Reed mats and baskets occurred in a variety of forms and with a number of uses. Some were used as storage containers for shelled corn and beans, others made up the temple altars. Even the bark of trees was used to fashion ropes or to make containers. Dugout canoes also were used and wood carving was important in making figures of birds and serpents. These are but a few examples which should indicate the complexity of Caddo subtractive technology. It is to be expected that the few preserved items of stone and bone primarily relate to the manufacture of other implements, containers, clothing, and other important artifacts of wood, hide, or textiles.

Cedar Grove burial artifacts comprise our primary evidence of nonutilitarian function. Although there are a number of grave items which conform to the technomic classification, the shell ornaments are especially prominent items for display, conspicuous consumption and, perhaps, measures of relative wealth, achieved and ascribed status. As such they qualify minimally as sociotechnic artifacts. The conch shell cup, assuming it was used mainly in the "black drink" ritual (Webb 1959:204), would be an ideotechnic artifact.

What makes the shell ornaments so conspicuous is that they are all from a distant source, occur exclusively in mortuary contexts as items of adornment or ritual paraphenalia (the zoomorphic pendant necklace?), and have a variable distribution within the mortuary population by burial group, age, and sex. Whether they are in toto or in part artifacts of high status (Webb 1959:110) is impossible to judge. Clearly their specialized disposal removed them from an ongoing social system, creating a scarcity which could only be rectified by continued nonlocal exchange mechanisms. While there may have been other integrative mechanisms of equal value to the Cedar Grove inhabitants, the marine shell artifact system of exchange/mortuary disposal is the one that is most tangible today. That they constitute the only artifact group found exclusively in a mortuary context suggests they were prestige items, if not items denoting wealth as we now use that term.

There may be several reasonable ways to evaluate the probable social significance of the marine shell artifacts. An approach which seems to be suitable to the particulars of Cedar Grove is to compare the kind, quality, and quantity of shell artifacts relative to the age and sex of each burial which has them as well as those which do not.

Only Burial Group C has associated marine shell artifacts. Schambach's ceramic analysis (Chapter 11) places this burial group with the latest site occupation, during the Chakanina phase. All other burials are slightly older and relate to the Belcher phase. In fact, all its interments have these items, regardless of their age or sex. Ages range from children of eight and 12-15 years at death to adults greater than 50 years at death within the burial group. The major difference among ages represented by this and the other burials, or burial groups is that 2 infants are represented by other burials associated with the house floors. Of the adults of Burial Group C, two are females (Burials 3,4) and three are males (Burials 5, 7, 9). The non-Burial Group C interments represent one adult female (Burial 11, 45 years), three adult males (Burials 8 and 14, 35-39 years; Burial 12, 30-34 years), and one child (Burial 15, 6 years).

Disturbance of the aboriginal interments by the historic cemetery may well have had an impact on the array of shell and other mortuary artifacts. For Burial Group C, Burials 3 (45-49 year old female) and 6 (eight year old child) were truncated by subsequent historic grave digging. Burials 11, 12 and possibly 13 were also similarly affected. But the difference between the burial groups is that, for Group C, the disturbance resulted in removal of most of the body cavity below the shoulders whereas the other burials sustained losses to the pelvis and lower extremities only. Inasmuch as the shell ornaments are normally found above the waist, it is doubtful the lack of these items for Burials 11-13 should be attributed to postinterment disturbance. More probable, however, is that disturbance of Burials 3 and 6 led to the loss of shell ornaments.

By age, the Group C burials younger than 40 years at death have both the greatest number, variety, and weight of marine shell artifacts. The most varied is Burial 4, a 20-24 year old female, who was adorned with bracelets, a bead necklace, and ear discs. All are unique ornaments not found with any other burial; the bracelets and necklace are conch columella beads of two different shapes and the ear discs are from the shell exterior. Total weight of the conch ornaments found with this burial is about 79 g, exceeded only by Burial 7, a 20-24 year old male with 278 g of conch shell artifacts. The majority of the conch weight for Burial 7, however, is the cup (222.2 g). The two tubular bead necklaces from Burials 7 and 5 (a 35-39 year old male) are the only necklaces which are stylistically similar for two burials and they weigh a total of 132 g, of which 76 g is accounted for by the Burial 5 necklace. The only other artifact type which is seen in two Group C burials is the conch ear pendants, fashioned from the columella. These are found with both the oldest (the 50 year or older male, Burial 9) and youngest (the eight year old child, Burial 6) Group C burials, and the younger individual has the larger and heavier pendants (total weight 33 g to 16 g). Excepting Burial 4, all Group C interments are represented by single ornaments or ornament sets, and Burial 7 has the additional conch shell cup. Burial 10, the 12-15 year old adolescent, has the zoomorphic pendant necklace, the artifact which is most likely to express intersite regularity, if not wealth or prestige. Burial 3, the 45-49 year old female, has the conch disc bead necklace which weighs about 17 g, but, as previously mentioned, has sustained possible loss of other shell ornaments.

What conclusions should be drawn from these facts? The first, and most certain, is that Burial Group C represents a subset of the mortuary population with direct

access to exotic marine shell artifacts. In virtually no other detail of age or sex (excepting the lack of infants) do they vary significantly from the other Cedar Grove interments. The lack of flintknapping tools and chipped stone arrow points also sets them apart from Burials 8, 12, and 14. Thus, their status within the Cedar Grove community might be inferred to have been different (in addition to being slightly later in time), and most likely expresses a superordinate hierarchical relationship with the remainder of a mortuary community.

Second, the concentration of marine shell items favors the younger adults and adolescents. This suggests an age-grade system may have existed, particularly for the males. If such existed, the marine shell ornaments would have served as explicit badges of age related rank. For instance, the zoomorphic pendant necklace may have denoted a high status adolescent; the tubular columella bead necklaces, young to middle aged adult males of high status. For the women, the reduction in quantity and kind of marine shell artifacts might similarly be construed as denoting an age-grading.

Third, the continuity in ornament style cross-cuts generational boundaries, at least for men. In this respect, the oldest (a male) and youngest (sex indeterminate) Burial Group C individuals have the same type of ear pendant and similar necklaces are worn by the young and middle aged adult males.

Fourth, and most speculative, is that the Group C interments represent a lineage of high status and ascribed ranking within age-grades.

The Caddo are known as "farmers with a class system" among whom ownership and inheritance of dwellings was matricentered (Driver 1969:522 and Map 30; see also Swanton 1942:170-173). Thus, it would be tempting to further project these findings to reconstruction of residence and descent relationships among the Cedar Grove mortuary population. As outlined by Allen and Richardson (1971), however, to do so would be an exercise in futility: the data are simply too ambiguous and could be reinterpreted in an almost endless number of ways, insofar as residence and descent are concerned. Even so, the mortuary data have made other--and, I think, equally important--contributions. The most valid and useful is the delineation of differential access (or disposal) of exotic items of marine shell within a segment of the mortuary population. The fact that these individuals were interred in one area separate from the others highlights their difference. That both sexes and all ages, other than infants, are represented within this mortuary subset, much as is apparent for the remainder of the burial series, needs to be carefully considered in evaluating the relative social value of both the burials and their artifacts. Burial group C has the composition of a corporate group with sole access to exotic and scarce artifacts. Regardless of whether this corporate group was a lineage, its organization is seemingly an age-grading symbolically identified by specific shell ornaments. The ornaments may or may not have had an intrinsic, absolute value which certified rank or status. What seems to be true is that they signify class structuring.

INTERSITE COMPARISONS

The chipped stone technology of other Caddo sites is perhaps not as well known as one would like but two northeast Texas sites, George C. Davis (Shafer 1973) and Mackin (Mallouf 1976:152-273), afford useful information. George C. Davis is a complex mound and village site on the Neches River. Mackin is similar but is on Big Pine Creek, a tributary of the Red River upstream from Cedar Grove. For both sites the investigators identified bipolar flaking as a primary lithic reduction technique which coincided with free hand percussion reduction of larger sized nodules. At George C. Davis, the lithic industry is dominated by locally obtained pebble to cobble-sized crypto-crystalline silicate gravels. Most are clearly from secondary sources, such as stream or pediment gravels. Some--particularly the finished Gahagan bifaces--were imported to the site and are made of exotic Edwards Plateau chert. At Mackin we see a similar use of both local and more distant lithic sources, but the larger material is locally obtained from Big Pine Creek locality and is generally not of as good a quality as the "imported" Red River gravels, which were primarily reduced by bipolar percussion. The primary contrast Cedar Grove has with either site industry is the apparent exclusive use of local stream gravels of pebble and cobble size which require bipolar reduction.

Relative to the finished artifacts, the greatest similarity is seen with the Belcher site (Webb 1959), especially Belcher Period III and IV. Besides the zoomorphic pendants, Belcher has similar socketed antler points, antler flakers and deer ulna punches, shell hoes, bone chisels, and various kinds of conch columella beads. As previously described, the zoomorphic pendants have the clearest parallels between these two Red River sites.

SUMMARY AND CONCLUSIONS

The subtractive technology for Cedar Grove and Sentell, two Red River Caddo sites, is partially represented by preserved stone, bone, or shell artifacts. Their analysis has employed a linear model of material acquisition, reduction, artifact use-life and discard. The general comparative approach also assessed these remains relative to experimental results of lithic bipolar percussion reduction, Caddo ethnographic data, and site context. Complementary distinctions in Cedar Grove artifact function in sex-linked artifact sets, and in prestige artifacts were suggested by contrasts in material, site context, and ethnographic data. Microwear examination of tools was beyond the scope of this study but are needed to fully explicate the two collections. Conclusions to this study follow.

1. The lithic technology of Cedar Grove and Sentell is similar in its employment of mainly locally obtained siliceous stream gravels, their initial reduction by bipolar percussion techniques, and production of typologically congruent artifacts. Variation in the two sites' collections is mainly due to sampling differences and resultant size differences, but Sentell has a few chipped artifacts of quartz crystal which may be evidence of a more distant source and other means of material acquisition.

2. The lithic technology of these two sites is also similar to other well studied Red River and Neches River Caddo sites, with one difference: Cedar Grove has no compelling evidence for lithic resource acquisition from other than local stream gravels.

3. The more comprehensive artifact assemblage from Cedar Grove contains stone, bone, and shell items which are diagnostic of the late Caddo period. These include but are not limited to corner notched, ovate, triangular, bifurcate base and tanged arrow points, socketed antler points and other bone implements, and ornaments of mainly exotic conch shell. Most of the chronologically sensitive artifacts from Cedar Grove are found at Belcher Mounds (Periods III and IV), and the most striking example is the zoomorphic pendant necklace which is essentially identical to one from Belcher.

4. The conch shell ornaments occur exclusively in mortuary contexts as items of adornment or ritual paraphenalia. They probably represent prestige items, taken out of circulation at the time of interment. Their resulting scarcity could only have been rectified by continued nonlocal exchange mechanisms.

5. A variety of stone, bone, and shell artifacts occur exclusively with juvenile, adult male, or female burials. These items are inferred to be sex-linked.

6. The exclusive occurrence of conch shell artifacts with all Burial Group C interments sets this group apart from the remainder of the Cedar Grove mortuary population. It is suggested that Burial Group C was a high status corporate group.

RECOMMENDATIONS

1. Microwear analysis of several bipolar percussion stone artifacts is needed to assess whether they are tools and, if so, how they were used. These include the edge damaged flakes, pieces esquillees, and edge retouched cobbles or cobble bifaces.

2. A detailed examination of Caddo zoomorphic pendants of the "lizard-effigy" type is recommended to determine when, where, and by whom these distinctive artifacts were made.

3. Manufacture of the chert cobble celt is seemingly rarely recorded at other Caddo sites (Moore 1912:566), although similar tools occur in the lower Mississippi River valley proper (Dan Morse, personal communication). These artifacts may have been overlooked in other Caddo studies. Their evaluation as a potential typological marker awaits further documentation. It is recommended that future workers carefully scan lithic debris for whole or fragmentary examples.

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Chapter 14

PLANT REMAINS FROM THE CEDAR GROVE (3LA97) AND SENTELL (3LA128) SITES

Frances B. King

Both because of the quality of preservation and the cultural period it represents, the Cedar Grove site is one of the most important late Caddo sites in southwestern Arkansas. It has well preserved flora and fauna as well as 16 aboriginal burials and an abundance of lithic and ceramic remains. Much better than any single source of information, the variety of data presented by such an outstanding site has the potential to provide unique insight into settlement patterns, social structure, technology, and subsistence which can be melded into a truly interdisciplinary study.

The archeobotanical remains of such a late Caddo habitation site are particularly interesting because of what they can show about exploitation of wild plants versus plant cultivation, the importance of maize in the diet, plant resources exploited, and possible seasonal occupation of the site.

METHODS

A total of 378 samples from the Cedar Grove site were examined for archeobotanical remains. These included all Priority I (20 burial, 19 feature, 40 midden, and 179 random column samples) and Priority II (40 postmold, 41 column samples) and other samples from levee fill, muck ditches, historic burials and roadbeds. A total of 21 additional samples were examined from the nearby Sentell site as well.

The samples submitted for analysis had been processed in varying manners. Some samples had been floated so that the sample examined consisted primarily of light carbonized and uncarbonized plant material, caught in a .4 mm sieve. Other samples had been waterscreened through either a 6.4 or 1 mm screen so that the samples contained both plant material, bone, rocks, and soil debris. The manner in which the sample had been processed is reflected in both the plant remains recovered and the time necessary for the analysis. Botanical remains from 6.4 mm waterscreen consist primarily of larger fragments of charcoal and nutshell—most seeds are lost. Flotation and 1 mm samples retain most types of plant remains. The only potential economic plants with seeds smaller than 1 mm are tobacco and some species of Amaranthus.

Except for random column samples, each lot was sorted into the various components of wood charcoal, nutshell of differing taxa, seeds, and other carbonized remains. An attempt was made to identify each fragment of wood charcoal larger than 2 mm. Seeds were identified and counted. Maize was present in the forms of both kernel and cupule fragments and varied in size from part of a single cupule to cob fragments of perhaps 10 cupules and to a few almost entire kernels. Maize fragments were both weighed and counted unless the fragments were tiny. Because of the large amount of extraneous debris compared to archeobotanical remains, weights were estimated for random column samples.

Identifications were made at 10 power with a binocular microscope. When necessary, comparison was made with reference material in the collections of the Illinois State Museum and published sources. All samples were scanned carefully for additional plant taxa, such as tobacco, which have tiny seeds or which might have been otherwise overlooked.

RESULTS

Remains of charcoal and carbonized remains of seeds or fruits of 17 plant taxa were recovered from the Cedar Grove site. These include six taxa of nuts, three cultigens, and eight other plant types (Tables 14-1 and 14-2). The identification of plant remains by provenience is provided in Appendix IX.

Cultigens

Maize is very widespread in the site, occurring in 57.9% of the features. However, there are no large aggregations of cobs or kernels such as occur at the Late Caddo Adair site (3GA1) which yielded 77 measurable cobs or the Lester Place site (3LA38), also in Lafayette County, which yielded six. Based on the analysis of radiocarbon isotopes (Wolfman, Chapter 17), it appears that maize was used heavily at the site. Processing methods may have been used which were not conducive to the carbonization and preservation of maize. For example, grinding maize or processing it with lime would both minimize the amount of kernels that might be preserved. It is also possible that a high level of human activity at the site contributed to the destruction and spread of relatively fragile carbonized remains across the site.

The largest specimen was a cob fragment two cupules wide and approximately five long. Cupule width ranges from 3.2 to 5.5 mm and represents a small grained maize, probably with row number between 12 and 16. Historically, the Caddo grew two types of maize, a small early variety and a larger, late variety. Based on cupule measurements, it appears that similar varieties may have been present at the Cedar Grove site.

Cucurbits at the Cedar Grove site are represented by two Lagenaria siceraria (bottle gourd) rind fragments, and a possible blossom scar (button) and seed fragment of Cucurbita pepo (pepo squash).

Nuts

Nuts are represented by the carbonized shell debris of six taxa. The most common is Carya sp. (hickory) which occurs in 13.7% of the samples overall, 26.3% of the feature samples, and 42.8% of the levee fill samples. Although hickory occurs in many samples, it is never abundant. Carya illinoensis (pecan), identified by its

Table 14-1. Plant remains from the Cedar Grove and Sentell sites (percent of samples of occurrence)

Plant Taxa	3LA97	Burial	Levee Fill	Midden	Feature	Column Sample	Postmolds	Random Columns	Other	3LA128
Maize	13.9	10.0		10.0	57.9	19.5	5.0	16.8	8.0	15.4
Bottle gourd	0.7		7.1			2.4		0.6		
Pepo squash	0.2						2.5			
Cane	0.1				26.0					
Hickory	13.7		42.8	27.5	26.3	14.6	7.5	11.7	12.0	38.5
Black Walnut	1.2					2.4		1.7	4.0	
Pecan	1.2			5.0	10.5					
Hazelnut	0.4			2.5				0.6		
Oak (acorns)	0.7				15.8					3.8
Beech	0.7							1.7		
American lotus	0.4			2.5				1.1	4.0	
Persimmon	2.4			5.0	15.8			1.1	12.0	7.6
Sumpweed	0.2				5.2					
Grape	0.9					4.8		1.1		
Charcoal	77.4	65.0	71.4	100.0	73.7	85.4	82.5	83.8		92.3
cf. Morning-glory	0.9				10.4	2.4	2.5			
Blackberry	0.2	5.0								
Sumac	1.0					4.8		1.7		
Wild bean	0.2							0.6		

Table 14-2. Volumes of plant remains for various portions of the Cedar Grove site: total weights and weights in g per sample (in parentheses)

Plant taxa	Burial	Feature	Midden	Column Samples	Postmolds	Random Columns
Charcoal	2.0(0.1)	4.6(0.2)	85.6(2.1)	11.2(0.3)	4.0(0.1)	34.3(0.2)
Maize	0.1(0.5)	1.9(0.1)	0.8(0.02)	0.6(0.02)	0.1(0.1)	3.6(0.02)
Black walnut				0.1(0.1)		0.5(0.1)
Hickory		0.9(0.1)	3.1(0.1)	1.5(0.1)	0.4(0.1)	2.6(0.1)
Pecan		0.5(0.1)	0.3(0.1)			
Hazelnut			0.4(0.1)			
Oak		0.3(0.1)				
Beech						0.2(0.1)

uniquely thin shell, occurs in 1.2% of the samples overall, 10.5% of the feature samples and 5.0% of midden samples. It occurs nowhere else at the site. Juglans nigra (black walnut) occurs in 1.2% of the total samples, 1.8% of the column and random column samples and 4% of "other" samples. Its absence from features and middens where other food remains were recovered suggest that the trees may have been growing near the site and that, while the nuts may have been eaten casually or occasionally burned for fuel, they were not an especially important food. Corylus americana (hazelnut) occurs in 2.5% of the midden and 0.6% of the random column samples, and acorn shell fragments occur in 15.8% of the feature samples and nowhere else.

In addition, 1.7% of the random column samples contain fragments of Fagus grandifolia (beech) nut husks. Beech is a tree of the cool, mesic forests of the Northeast. It occurs in Arkansas today only in the most sheltered ravines. It does not currently occur in Lafayette County although it does occur in adjoining Miller, and Columbia Counties. Beech is one of the trees most sensitive to flooding (Fowells 1965:173), although it will grow on poorly drained sites not subject to flooding. The Red River has migrated extensively within its floodplain since the Cedar Grove site was occupied. It seems possible that beech may have been growing near the site 300-400 years ago. The absence of beech from features or midden samples supports the suggestion that it may have been growing near the site but was not used by the Indians.

Seeds

Seeds are represented by eight taxa at the Cedar Grove site. Of these, four occur in midden of feature samples while the others occur in random or column samples.

Iva annua (sumpweed or marsh elder) is represented by a single carbonized seed from Feature 18, a hearth. The seed has reconstructed achene measurements of 3.2 x 2.9 mm and is small, even for a wild specimen. There is nothing to verify whether sumpweed was, or was not, being eaten at the Cedar Grove site.

A nut of American lotus (Nelumbo lutea) occurs in one midden sample and fragments occur in a random column sample. Lotus was an important aboriginal food plant, transported far outside its normal range by the Indians. The root, tubers, shoots, and nuts are all edible. The presence of lotus at the Cedar Grove site suggests that this may have been an important food resource to the inhabitants of the site. Because it occurs in ponded rather than moving water, the distribution of American lotus is local and scattered. Since the plant is easily established in new water bodies, the presence or lack of lotus would probably not have been a consideration in the placement of the Cedar Grove site.

Persimmon (Diospyros virginiana) seeds are common, occurring in 5.0% of the midden samples, 15.8% of the features, 1.1% of the random columns and 12.0% of other samples from the site. Persimmon fruits ripen in the fall and are often considered most "tasty" after the first frost. They are large and meaty fruits and can be dried for use during the winter. Persimmons are a common plant

encountered in archeological sites in the Arkansas-Missouri area and were undoubtedly an important food.

Grape (Vitis sp.) seeds occur in 4.8% of the column samples within larger units and 1.1% of the site wide random column samples, Rubus sp. (blackberry or raspberry) in 5.0% of burial samples, Rhus sp. (sumac) in 1.8% of column and random column samples and Convolvulaceae (cf. Ipomoea sp., but not I. pandurata) in 10.4% of features, 2.4% of column samples in the larger excavation units, and 2.5% of postmold samples. With the exception of Ipomoea all these are potential food plants. The fruit of grapes and raspberry or blackberry were eaten and, those of sumac used to make a lemonadelike beverage. Wild bean is often found in archeological sites although it was not used as a food plant by historic Indians.

Charcoal

Charcoal is present in virtually all samples, often in minute amounts. The taxa represented by the charcoal include Juglans sp. (walnut), Taxodium distichum (cypress), Carya sp. (hickory), Ulmaceae (elm or hackberry), Acer sp. (maple), Fraxinus sp. (ash), Arundinaria gigantea (cane), Quercus sp. (oak), Platanus occidentalis (sycamore) and Pinus sp. (pine). All these taxa are characteristic of the general Cedar Grove area today. The cane charcoal appears usually to be from large diameter stems, bigger than those generally found growing today. Cane is the only native American bamboo and is a perennial woody grass. It was hit particularly heavily by early historic land clearance and grazing.

DISTRIBUTION OF FLORAL REMAINS

Burials

Small amounts of wood charcoal were the most common type of remains found with the Cedar Grove burials, although Burial 9 lacked even that. A single carbonized blackberry or raspberry seed accompanied Burial 8 and Burial 15 included 4 maize cupule fragments. Two of these fragments measured 3.2 and 3.3 mm wide. Botanical remains from Historic Burial 13 included a coffin fragment of uncarbonized pine wood complete with a nail.

Postmolds

Although most contained minute amounts of charcoal, postmolds were devoid of plant remains. Several contained a few small maize fragments or bits of nutshell debris. Postmold 53 contained a single small rind fragment of Lagenaria siceraria (bottle gourd).

Features

As a whole, the features contained a greater variety of plant remains than any other portions of the site. Feature 18, a hearth, was particularly interesting in that it contained maize cupule fragments, sumpweed, persimmon, hickory and acorn shell debris. Three of the maize cupules from this feature were measurable and are 4.2, 5.0, and 5.0 mm in width. These cupules are somewhat larger than those from other units such as Burial 15. With the possible exception of sumpweed, all remains would indicate a midautumn use of the hearth.

Midden

The midden samples contain primarily wood charcoal. Only 10.0% of the samples contain maize. The midden does contain fragments of carbonized American lotus and a probable pepo squash seed. It also contained persimmon, hickory, and pecan.

Column Samples

Column samples within larger excavation units and random column sample are the most numerous; material from 220 levels (10 cm) were analyzed. Because of the great number of samples and their widespread distribution across the site, these samples include representatives of almost all plant taxa found at the site. They are lacking only in pecan, acorns, lotus, pepo squash, sumpweed, blackberry or raspberry, and sumac. Since the widespread distribution of these samples would promote the collection of the greatest representation of plants growing on or near the site, the presence of black walnut, grape, and beech in these samples and not in the features or midden suggest they were growing at the site during occupation and were probably carbonized accidentally or as the result of limited usage.

The Sentell Site (3LA128)

The nearby Sentell site has both Caddo II/III and Caddo IV components. As such the site may be valuable for comparative purposes even though the sample size of 21 is small. Maize occurs in 15.4% of the samples, hickory in 38.5%, acorns in 3.8%, persimmon in 7.6%, and charcoal in 92.3%.

DISCUSSION

The excellent preservation of human skeletal material, flora and fauna at the Cedar Grove site offers a rare opportunity to study late Caddo subsistence activities. Rose (Chapter 16) suggests on the basis of skeletal characteristics that there were major changes in settlement and subsistence during the early Caddo times that were accompanied by increased reliance on maize in comparison to earlier and later periods. Based on the decrease in evidence of iron deficiency anemia, a disease which in this case can be at least partially linked to heavy maize utilization, Rose also suggests that either the reliance on maize declined over time, new processing methods increased the food value, or that iron rich foods such as meat increased in the diet. In addition, Rose notes, on the basis of dental wear, that the diet consisted of nonabrasive soft foods and that these were not prepared with stone. This means a low consumption of nuts and vegetable fibers, or an extensive processing system.

Archeobotanical remains from the site tend to support the interpretations based on bioarcheological evidence. In particular, both the distribution of maize and nutshell in the site indicates a low level of usage or processing methods which were not conducive to carbonization and preservation. For example, grinding maize or processing it with lime would both minimize the amount of kernels that might be preserved.

Although maize is widespread at the site, occurring in 57.9% of the features, there are no large aggregations of cobs nor of kernels. Almost all specimens of maize are single cupule or kernel fragments. This suggests that they may have originally been burned in hearths but were then increasingly broken and scattered across the site, possibly by human activities. In comparison, the late Caddo Adair site (3GA1) yielded 77 measurable cobs and the Lester Place Site (3LA38), also in Lafayette County, yielded six.

Although widely spread throughout the site, the frequency and abundance of nutshell is much lower, for example, than that of virtually any Late Archaic period site in the Midwest where nuts are definitely an important food resource. In general, nutshell occurs in practically all samples from such sites and is extremely abundant at times.

Often too, there is an emphasis on hickory nut and little representation by other nut taxa. The use of nuts for food cannot be easily differentiated from their use for fuel. Whatever the case, late Caddo occupants of the Cedar Grove site were apparently using a small amount of nuts which must have been collected casually.

The presence of American lotus, widely used by the historic Indians as a "staple" (Swanton 1946) suggests that this may have been the case at the Cedar Grove site. The tubers were often pit roasted for many hours until soft, although sometimes they were sliced and dried, to be reconstituted by boiling. Lotus roots are approximately 90% of carbohydrate and 0.1 g of fat. In comparison, potatoes have 78% water, 2.1 g of protein, 17.1 g of carbohydrate and 0.1 g of fat. Lotus root contains 0.4 mg of iron, compared with 0.6 mg for potatoes and 2.1 mg for field corn (Watt and Merrill 1963). However, if the tubers were dried and the water content reduced to 10%, which is typical for dried foods, the food value would increase to approximately 441 cal/100 g, compared to 348 cal/100 g for field corn.

Several plants listed by Swanton (1942) were not recovered from the Cedar Grove site. These include beans, tobacco, sunflowers, and watermelons. Almost certainly beans, tobacco, and sunflowers were being grown in addition to the maize, pepo squash and bottle gourd. Hemmings (1982) noted that there was evidence for the exploitation and processing of pecan and hickory at the Spirit Lake (3LA83) site but that there were cultigens. Likewise, no cultigens other than maize were recovered from the Lester Place (3LA38) site (Cutler and Blake 1976). There is therefore no evidence for the cultivation of plants other than maize, pepo squash, and bottle gourd from the Cedar Grove area. The question remains whether the absence of other domesticated plants is due to sampling error and lack of preservation or due to actual absence.

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Chapter 15

FAUNAL EXPLOITATION AT THE CEDAR GROVE SITE

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INTRODUCTION

Excavations at the Cedar Grove site (3LA97), a late Caddoan farmstead, in the Red River Valley of southwestern Arkansas, yielded a well preserved faunal assemblage. Most of the faunal remains from the site come from buried midden deposits attributed to a Caddo IV/V occupation dating to approximately A.D. 1670-1730. An earlier Caddo midden accumulation (Cedar Grove I component; see Chapter 11) situated to the east of the main excavations at the site also yielded faunal remains which are described in this report. Animal bones and shell recovered in midden, feature, and burial context by handpicking, waterscreening (6.4 mm and 1 mm mesh), and flotation (1 mm mesh for heavy fraction and .4 mm for light fraction) were analyzed at the Illinois State Museum.

The faunal analysis is aimed at the reconstruction of subsistence activities and consequently settlement function. Research goals are to characterize resource selection at the site by examining the species and habitats exploited versus those which were presumably available in the late seventeenth and early eighteenth centuries. The nature of subsistence pursuits at the site (i.e., degree of specialization in use of species and/or habitats) has direct relevance to the determination of the role of the Cedar Grove site in the overall late Caddoan settlement cycle. Interpretations of seasonality of occupation based on the faunal assemblage are also attempted.

Distribution of fauna across the site is examined as a key to human processing and disposal of fauna. Fauna derived from sediment columns randomly spaced across the site are examined to isolate areas of the site with concentrations of faunal remains. Fauna associated with burials, other pit features, and midden are contrasted. Human processing of animals is considered through examination of food processing marks (such as cuts), body part representation, and portion of individual bone elements. Burning is also examined to determine if cooking and/or garbage disposal techniques could be ascertained.

The assemblages found in habitation and mortuary context are compared to previous archeological and historic accounts of the Caddo. Faunal remains were carefully scrutinized to determine if European-introduced domestic animals had been incorporated or if a more traditional subsistence economy was still in operation. The faunal assemblage from the earlier Caddo midden is compared to that from the main occupation area at Cedar Grove as is the limited assemblage from the nearby Sentell site (3LA128), another late Caddoan occupation encountered in this project.

METHODS

The faunal analysis concentrated on the Priority I samples as established by Trubowitz (Chapter 7). Samples from the following major contexts were analyzed at the Cedar Grove site: (1) the aboriginal features F3-F21, (2) the aboriginal burials B1-B15, (3) the midden deposits including levee overburden and undisturbed midden from levee transect units LTU1-LTU14, (4) a judgmental sample of randomly placed sediment columns including 141 column samples from 35 columns, (5) the overbank midden in S48.77 E157, and (6) the Caddo III midden in one 3 m test unit. With the exception of this Caddo midden, these deposits should date to late Caddoan (Caddo IV/V) times. Separate tabulations for faunal remains recovered in each of these different contexts are provided to allow comparisons. The context for the levee overburden overlying the undisturbed midden in the levee transect units is questionable; however, this levee was constructed with fill taken from the archeological site. Since this overburden does not represent *in situ* deposits, separate faunal tabulations are provided for the overburden and midden within each levee transect unit. All faunal remains from the Sentell site were categorized as Priority I and were analyzed for this report.

For the purposes of this analysis faunal remains were divided into two major categories based on recovery technique. The macrofauna includes fauna recovered by handpicking and 6.4 mm mesh screening. Laboratory processing separated out 12.8 mm mesh screening from these samples. The microfauna includes fauna derived from fine mesh (1 mm) waterscreening and barrel flotation (1 mm and .4 mm mesh). Analytic methods varied for the macrofaunal and microfaunal fractions. All macrofauna from the Priority I samples was analyzed. Tabulations for fauna collected by handpicking and screening are combined. All bone fragments from macrofaunal samples were categorized and described unless specified otherwise. This procedure was modified only in the case of the human burials. Samples from several burials contained thousands of fragments of indeterminate vertebrate bone, possibly derived from weathering of human skeletal elements, which made the normal quantification scheme unwieldy and uninformative. In these instances, only bones identifiable to class were systematically quantified. These deviations are noted in summary tables. Microfaunal remains from all flotation samples and from a judgmental sample of fine screen samples were analyzed. Flotation samples were available for select burials, features and levee transect units. Fine screen samples were examined for levee transect units only. Those from random column samples were not examined based on the paucity of fauna in most of these samples and prior knowledge about the distributions of fauna on the site based on macrofauna. In microfaunal samples only bones identifiable to element and at least class of animal were tabulated and described.

Identifications of faunal remains were made by direct comparison to modern specimens in the Illinois State Museum collections by Mona Colburn, Research Assistant, and were checked by the authors. Descriptive attributes for faunal remains were coded and stored on a Zenith (Z-89) microcomputer. The attributes coded are: (1) provenience (feature, burial, levee transect unit number, overbank midden, early Caddo midden, column sample, Sentell site) and field serial number, (2) class of animal

(indeterminate vertebrate, gastropod, pelecypod, fish, amphibian, reptile, bird, mammal), (3) taxon to the most precise level possible, e.g., genus and species, (4) body part, e.g., numerus, (5) symmetry of the element, i.e., right or left, (6) portion of the element, e.g., dorsal, ventral, proximal, distal, (7) body size, i.e., small, medium, large, or 8 cm size class grouping for fish, (8) burning, e.g., black, calcined, (9) completeness of the element, i.e., half present, greater than half, less than half, (10) modifications, e.g., canid gnawing, rodent gnawing, human processing, weathering, (11) total count identical for all attributes, (12) comments, e.g. any additional information on modifications, articulations with other elements, age of animal. Long comments were numbered and additional information was recorded by comment number in a separate log. Modified specimens were drawn in the log to show the location and nature of processing marks.

Fish elements identified to at least genera were sized by comparison with specimens of known length in the Illinois State Museum collections. Estimates of the standard length of the fish are given as 8 cm size class groupings. The first size class is for fish less then 8 cm in length; the second class groups fish with standard lengths greater than 8 cm and less than or equal to 16 cm.

Tabulations of numbers of fragments and minimum numbers of individuals (MNI) are presented separately for macrofaunal and microfaunal fractions for each burial, feature, and levee transect unit. Estimates of minimum numbers of individuals are not provided for overburden within levee transect units. Separate tabulations for the overbank midden and the Caddo III midden are also provided. MNI estimates are not provided for the column samples. MNI estimates are based on tabulation of element, portion, symmetry, and body size for fish, and they summarize the most abundant singly occurring element in the body per taxon within a provenience unit as specified above.

RESOURCE AVAILABILITY

Situated on a point bar in the meander belt zone of the Red River valley, the Cedar Grove site offered access to a wide variety of floodplain resources. In order to understand late Caddoan resource selection, it is necessary to first gain some understanding of resource distributions in the late seventeenth and early eighteenth century. Although the Red River has meandered across the floodplain and changes in local vegetation have undoubtedly occurred, given the late occupation of this site, early historic records provide at least an approximation of the resources present in late Caddoan times. King's reconstruction of the presettlement vegetation (Chapter 4) and the assessment of floodplain characteristics by Hemmings (1982) provide basic descriptions of terrain and vegetation. As discussed by Hemmings, vegetation zones were diverse, closely spaced, and linear and were subject to seasonal flooding. The aquatic zones included the Red River, oxbows, and backswamps. The site itself is located in sweetgum forest on well drained soils bounded by the river to the west and poorly drained soils supporting willow and oak and backswamps to the east. Backwater lakes were located near the site. Small prairie openings were probably available near the site but would not have offered as strong an attraction to game and aboriginal hunters as the sections of forest with oak and as the aquatic habitats.

Based on Sealander's (1979) studies of mammal distributions in Arkansas and his distribution maps, a diverse variety of potentially economically important species would have been available in the Red River valley in Lafayette County. Bottomland forests sustained opossum (Didelphis virginiana), armadillo (Dasypus novemcinctus), gray squirrel (Sciurus carolinensis), fox squirrel (S. niger), southern flying squirrel (Glaucomys volans), and gray fox (Urocyon cinereoargenteus). The armadillo is a recent invader to the state (Sealander 1979:13, 107) and was probably not available at the time of site occupation. Additional bottomland forest dwellers which would have been available along water courses include beaver (Castor canadensis), muskrat (Ondatra zibethicus), raccoon (Procyon lotor), long-tailed weasel (Mustela frenata), mink (M. vison), and river otter (Lontra canadensis). Swamp rabbit (Sylvilagus aquaticus) would have been available in bottomland swamps and forest. Areas of open forest and forest edge would have contained woodchuck (Marmota monax), coyote (Canis latrans), striped skunk (Mephitis mephitis), and most importantly, white-tailed deer (Odocoileus virginianus). Areas of dry forest may have supported eastern cottontail (Sylvilagus floridanus). Dry prairie areas may have supported plains pocket gopher (Geomys bursarius), coyote (Canis latrans), and red wolf (Canis rufus). The eastern spotted skunk (Spilogale putorius) can be found in such areas today but this is due to an eastward range extension in the 1950s and 1960s (Sealander 1979:233).

The availability of elk (Cervus canadensis) in the area is uncertain. Although once common in the Ozark Plateau of northwestern Arkansas and in bottomland swamps of northeastern Arkansas (Sealander 1979:255), Sealander's reconstruction of the former distribution does not include the Gulf Coastal Plain of southwestern Arkansas (p. 256). Elk may not have been available in the immediate site vicinity. The distribution of black bear (Ursus americanus) is also questionable. Bear prefer heavily forested areas and are now mainly restricted to the Ozark and Ouachita National Forests (Sealander 1979:213). Swanton (1942:137) provides historic and modern accounts of the hunting of bear by Caddo Indians but details are not given. Bison (Bison bison) may also not have been available in close vicinity to the site. Although once widely distributed across the state, bison were extirpated by 1820 (Sealander 1979:269). Descriptions of bison hunting by Caddo Indians are provided in Swanton (1942:136-137). The proximity of bison herds to the Cedar Grove locality is unknown. One excerpt for the eastern Caddo provided in Swanton (1942:136) notes that it was a four day trip to the closest bison herds.

Other fauna which are generally associated with upland settings, such as red fox (Vulpes vulpes) and bobcat (Lynx rufus), may not have been available in the site vicinity. The ringtail (Bassariscus astutus) although found occasionally in brushy upland areas today, is a recent intruder in Arkansas (Sealander 1979:219).

Based on distribution maps presented in Robbins et al. (1966) and Bellrose (1976), a wide variety of birds would have been available in the Red River Valley floodplain. Actual species presence and abundance would have varied dramatically with the seasons. Only species of potential economic importance as sources of meat, bone, and feathers are summarized here. Several species would have offered yearround sources of meat and feathers for adornment and ceremony including the turkey (Meleagris gallopavo) in forest settings and possibly the greater prairie chicken (Tympanchus cupido) in prairie areas. Least grebes (Podiceps dominicus) and great blue herons (Ardea herodias) would have been available yearround along water bodies. The red-tailed hawk (Buteo jamaicensis) and the red-shouldered hawk (B. lineatus) would have been available yearround in wooded areas.

Other species of potential economic importance show seasonal fluctuations in availability. The following aquatic birds and waterfowl would be maximally available in the spring and fall: common loon (Gavia immer), white pelican (Pelecanus erythrorhynchos), blue goose (Chen caerulescens), snow goose (C. hyperborea), American widgeon (Mareca americana), shoveler (Spatula clypeata), blue-winged teal (Anas discors), green-winged teal (A. carolinensis), redhead (Aythya americana), canvasback (A. valisineria), greater scaup (A. marila), ruddy duck (Oxyura jamaicensis), red-breasted merganser (Mergus serrator), and hooded merganser (Lophodytes cucullatus). Osprey (Pandion haliaetus) were probably available along water courses.

A few taxa would have been maximally available in the summer including green heron (Butorides virescens), wood duck (Aix sponsa), and broad-winged hawk (Buteo

platypterus.) The wood duck may have been available yearround in areas of open woodland bordering lakes and streams (Robbins et al. 1966:50).

Some of the surface-feeding and bay ducks may have been maximally available during the winter. Taxa in this category include mallard (Anas platyrhynchos), black duck (A. rubripes), pintail (A. acuta), gadwall (A. strepera), ring-necked duck (Aythya collaris), lesser scaup (A. affinis), common goldeneye (Bucephala clangula), and bufflehead (B. albeola). The trumpeter swan (Cygnus buccinator) once wintered along the Mississippi river (Bellrose 1976:89) and thus stragglers may have occurred along the Red River. Canada goose (Branta canadensis) also would have been present along the Red River in the winter. Two birds of prey valued for feathers by many historic Indian groups, the bald eagle (Haliaeetus leucocephalus) and golden eagle (Aquila chrysaetos), would have been available in the winter.

The Red River, oxbows, and backswamps should have provided good habitat for waterfowl during most seasons of the year. Summer would have been the least optimum time for waterfowl procurement.

The aquatic habitats of the Red River Valley should also have supported a diverse variety of turtles. Based on range maps presented in Conant (1975) the following taxa are present in southwestern Arkansas: alligator snapping turtle (Macroclemys temmincki), common snapping turtle (Chelydra serpentina), stinkpot (Sternothaerus odoratus), razor-backed musk turtle (S. carinatus), Mississippi mud turtle (Kinosternon subrubrum), Ouachita map turtle (Graptemys pseudogeographica), map turtle (G. geographica), Mississippi map turtle (G. kohni), southeastern painted turtle (Chrysemys picta), slider (C. concinna), Missouri slider (C. floridana), red-eared turtle (C. scripta), western chicken turtle (Deirochelys reticularia), midland smooth softshell (Trionyx muticus), and pallid or western spiny softshell (T. muticus). The range of the common map turtle (Graptemys geographica) is primarily to the north and east (Conant 1975), but it may occur in the study area. Terrestrial environments would have supported the three-toed box turtle (Terrapene carolina) and possibly the ornate box turtle (T. ornata). The range of the ornate box turtle is primarily to the west but it does intersect extreme southwestern Arkansas (Conant 1975).

The Red River and associated oxbows, backwater lakes and backswamps would also have been productive areas for fish. Based on distribution maps presented in Pflieger (1975), a diverse variety of fish would have been available in the Red River drainage. Fish of potential economic importance probably included bowfin (Amia calva), longnose gar (Lepisosteus osseus), spotted gar (L. occulatus), shortnose gar (L. platostomus), alligator gar (L. spatula), skipjack herring (Alosa chysochloris), Alabama shad (A. alabamae), gizzard shad (Dorosoma cepedianum), threadfin shad (D. petenense), grass pickerel (Esox americanus), chain pickerel (E. niger), blue sucker (Cycleptus elongatus), bigmouth buffalofish (Ictiobus cyprinellus), smallmouth buffalofish (I. bubalus), black buffalofish (I. niger), highfin carpsucker (Carpiodes velifer), river carpsucker (C. carpio), spotted sucker (Minytrema melanops), golden redhorse (Moxostoma erythrurum), black bullhead (Ictalurus melas), brown bullhead (I. nebulosus), yellow bullhead (I. natalis), channel catfish (I. punctatus), blue catfish (I. furcatus), flathead catfish (Pylodictus olivaris), white bass (Morone chrysops), yellow bass (M. mississippiensis), smallmouth bass (Micropterus dolomieui), spotted bass (M. punctulatus), largemouth bass (M. salmoides), warmouth (Lepomis gulosus), green sunfish (L. cyanellus), spotted sunfish (L. punctatus), bantam sunfish (L. symmetricus), redear sunfish (L. microlophus), orange-spotted sunfish (L. humilis), longear sunfish (L. megalotis), bluegill (L. macrochirus), rock bass (Ambloplites rupestris), white crappie (Pomoxis annularis), black crappie (P. nigromaculatus), flier (Centrarchus macropterus), walleye (Stizostedion vitreum), sauger (S. canadense), and freshwater drum (Aplodinotus grunniens). A diverse variety of minnows, most with small maximum body sizes, would also have been available.

The varied habitats of the Red River and its associated oxbows and backwater lakes would also have supported a diverse variety of freshwater mussels. Conditions for procurement of mussels would have been best during periods of low water after the retreat of spring floodwaters and on into the summer and fall.

In summary, the aquatic and terrestrial environments of the Red River floodplain would have offered a diverse variety of mammals, fish, birds, turtles, and freshwater mussels. Faunal resources were available to site inhabitants during virtually every season of the year. The period of spring flooding would probably cause the biggest problem for site occupants.

DISTRIBUTION OF FAUNAL REMAINS AT THE CEDAR GROVE SITE

One goal of the faunal analysis was to examine the distribution of faunal remains across the Cedar Grove site. Emphasis was placed on the main occupation of the site during Caddo IV/V times. Faunal remains were preserved in four major contexts at the site: (1) in features, (2) with burials, (3) in undisturbed midden underlying the levee, and (4) in a midden deposit in the area of an old slough which has been designated the overbank midden deposit. Bone was also derived from disturbed contexts in the actual fill of the levee. This levee was constructed from site sediments so faunal remains may actually derive from the Caddo IV/V occupation.

Midden Column Samples

Macrofauna from a series of randomly placed sediment columns were examined in an effort to isolate areas with concentrations of faunal remains. Counts of bone and shell encountered in the analysis of 141 samples from 35 sediment columns are presented in Table 15-1. The highest densities of faunal remains were encountered in five columns, S65 E175, S63 E179, S68 E179, S54 E181, and S74 E184. These columns occur in the area surrounding the levee transect units suggesting that these excavations encountered an area with concentrations of faunal remains.

The midden column samples yielded few specimens which could be identified beyond the family level (Table 15-2). Most of the fragments were attributed to large mammal and even those attributed to medium mammal were likely from a deer-sized animal. The single element attributed to bison was a second phalange recovered in the 10 to 20 cm level of S39 E164. According to Trubowitz (personal communication, 1983), this should be in undisturbed midden context. The fish component was dominated by ganoid scales from gar (Lepisosteus sp.). Although the column samples provide valuable information on the vertical and horizontal distribution of fauna across the site, the low counts provide little information on subsistence practices at the site. Hence it was decided that more emphasis should be placed on analysis of faunal remains from the undisturbed midden encountered in the levee transect units.

Undisturbed Midden-Levee Transect Units

Macrofaunal remains recovered in the levee transect units are summarized in Table 15-3. Fauna recovered in overburden and levee fill (OB) for each levee transect unit is summarized in the far right column of this table. Only remains from undisturbed midden context were used in the calculation of MNI. Faunal remains in this midden deposit are highly fragmented and many showed evidence of staining possibly with manganese. Many also showed signs of gnawing by carnivores (probably dogs) and rodents. Data on modification by animals and humans will be summarized in a later section of this report. The midden assemblage is clearly dominated by fragments of bones from large mammals. Bones attributed to deer were recovered in

Table 15-1. Distribution of macrofaunal specimens in random column samples (bone/shell)

Column Location	Depth of Sample (cm) 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
S60 E154	0/0	0/0	1/0	0/0	1/0	1/0		
S64 E154	0/0	0/0	0/0	1/0	1/0	0/0	0/0	0/0
S59 E157	1/0	0/0	0/0	0/0	0/0	2/0	0/0	
S39 E164	0/0	1/0	0/0	0/0				
S43 E164	[illegible]	2/0	1/0	2/0	0/0			
S59 E164	0/0	0/0	0/0	0/0	0/0			
S76 E164	1/1	0/0	0/0	0/0				
S41 E168	0/0	0/0	3/0	2/0	0/0			
S56 E168	1/0	0/0						
S75 E168	0/0	0/0	1/0	3/0	1/0			
S78 E168	1/0	0/0	2/0	0/0	0/1			
S40 E175	1/0	0/0						
S65 E175	3/0	1/0	3/0	2/0	0/0	7/0	7/0	
S80 E175	1/0	1/0	4/0	1/0				
S83 E175	0/0	0/0	1/0	0/0	0/0			
S61 E179	3/0	2/0	1/0	0/0	0/0			
S63 E179	0/0	1/0	1/0	5/0	7/0	9/0	5/0	7/0
S68 E179	0/0	3/0	9/0	5/0	6/0			
S71 E179	3/0	1/[illegible]	0/0	1/0	1/0			
S75 E179	0/0	0/0	0/0	0/0	1/0	1/0		
S81 E179	0/0	1/0	2/0					
S38 E181	0/0	1/0						
S54 E181	9/0	17/0	16/0	8/24				
S75 E181	0/0	0/0	0/0	1/0	2/0	0/0		
S69 S184	0/0	0/0	0/0	2/0	1/0			
S73 E184	1/0	1/0	0/0	0/0				
S74 E184	0/0	1/0	9/0	0/1				
S75 E192	4/0	0/0						
S81 E209	1/0	0/0	0/0	0/0				
S83 E209	2/0	0/0	2/0	0/0				
S77 E214	0/0	2/0	0/0					
S70 E218	3/0	2/0	0/0	0/0	0/0			
S75 E218	1/0	2/0	0/0					
S68 E222	3/0	2/0	0/0	0/0				
S81 E222	0/0	0/0	0/0					

Table 15-2. Macrofauna present in 141 column samples from 35 columns

Taxon	Number of Fragments
Pelecypod	24
Uniomerus tetralasmus	1
Actinonaias sp.	1
Lepisosteus sp.	18
Amia calva	1
Aplodinotus grunniens	1
Colubridae	1
Turtle	11
Graptemys sp.	1
Medium bird	2
Large bird	1
Medium mammal	64
Large mammal	90
Mammal	1
Cervus/Odocoileus	3
Bison bison	1
Vertebrate	26

every levee transect unit. Deer is represented by elements from all parts of the body including antler, the petrous portion of the temporal, teeth, mandible, an atlas, other vertebrae including lumbar vertebrae, ribs, scapulae, radii, ulnae, femora, tibiae, patella, pelvis, metacarpals, metatarsals, podials (greater cuneiforms, lesser cuneiforms, naviculo-cuboid, scaphoids, calcanea, pisiform, astraguli, unciform), sesamoids, and phalanges. The Cervus/Odocoileus counts all refer to antler fragments which are widespread in the midden deposits. The single element definitely attributed to elk is a lower fourth premolar from Levee Transect Unit 11. Raccoon shows a moderate distribution in midden deposits occurring in five of the levee transect units. Other mammals are sparsely represented with opossum, dog, and fox squirrel occurring in only two units each. Rabbit remains are found in a total of four levee transect units with both eastern cottontail and swamp rabbit present in one unit each. The fox squirrel, beaver, rice rat (Oryzomys palustris), pine vole (Microtus pinetorum), black bear, mink, and elk all occur in only one levee transect unit each. The single element attributed to domestic pig (Sus scrofa), a lower first incisor, was recovered in levee overburden and thus is not in definitive late Caddoan context. Two human (Homo sapiens) teeth were recovered in Levee Transect Unit 11. One is a decduous lower canine from the overburden and the other is a permanent lower molar from undisturbed midden context.

The bird assemblage in the midden, like the mammal assemblage, is not diverse. Only the turkey, although not represented by many fragments, is widely distributed occurring in seven levee transect units. Canada goose

Table 15-3. List of macrofauna recovered from Levee transects. Specimens from overburden and fill are summarized separately with no MNI determinations (#fragments/MNI) (OB=levee overburden)

Taxon	Levee Transect Number															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	OB
Gastropod								3						1		1
Pelecypod	2	5			3			1	1			15				
Fish	1	3	2	1		1	4	3	1	1		7		5		7
Medium Fish							1									
Large Fish	1											1		1		1
Lepisosteus platostomus	1/1	1/1														
Lepisosteus spatula						1/1	1/1					1/1				
Lepisosteus sp.	11/1	6/1	6/2	1/1		13/1	42/2	21/1	26/1	11/1	1/1	38/3	2/1	5/1		38
Amia calva		1/1	1/1	1/1				2/1	3/1	1/1		9/2	1/1	5/2		4
Esox sp.					1/1											
Large Catostomidae							1	1								
Catostomidae							1									
Ictiobus niger/bubalus												1/1				
Medium Ictaluridae					1		1									
Large Ictaluridae						1										
Ictalurus natalis												1/1				
Aplodinotus grunniens	2/1									1/1						2
Snake																1
Turtle	14	8	10	6	6	8	46	15	19	2	1	5	2	11		46
Chelydra serpentina							1/1									
Macroclemys termincki											1/1	1/1	1/1			
Chrysemys scripta								1/1								4
Chrysemys sp.	1/1						3/1	3/1								
Chrysemys/Graptemys									2/1							
Terrapene carolina							1/1	1/1	1/1							
Terrapene sp.							1/1	5/1	3/1					3/1		1
Trionyx sp.	2/1						1/1									
Bird			1	2	1		3		1	4						2
Medium bird		1			2							1		2		
Large bird	4	7	1			8	9	11	15	3	2	13		31		16
Branta canadensis					1/1		2/1									1
Cygnus sp.							1/1									
Medium Anatidae														1		
Large Anatidae							1									
Meleagris gallopavo		1/1		1/1			1/1	1/1	2/1			3/1		1/1		
Mammal									5							1
Small mammal		1						1								
Medium mammal	2	2	1	31	1	9	22	3	69	19	1	3	10	11	1	51
Large mammal	179	190	165	97	152	282	201	176	160	10	18	181	4	149		635
Didelphis virginiana							1/1							1/1		
Homo sapiens												1/1				1
Sylvilagus floridanus							1/1									
Sylvilagus aquaticus												1/1				
Sylvilagus sp.		1/1														
Sciurus carolinensis	1/1													1/1		
Sciurus niger							1/1									
Castor canadensis												1/1				
Peromyscus sp.																4
Oryzomys palustris											1/1					
Microtus pinetorum														2/1		
Canis familiaris		1/1				1/1										1
Canis sp.				1/1												
Ursus americanus									1/1							
Procyon lotor						1/1			3/1		1/1	1/1		7/1		
Mustela vison		1/1														
Sus scrofa																1
Cervus canadensis																
Cervus/Odocoileus	9/1		2/1	6/1	3/1	3/1	11/1	7/1	9/1			11/1		45/1		11
Odocoileus virginianus	5/1	20/1	6/1	6/1	4/1	4/1	9/1	7/1	20/1	1/1	5/1	23/2	1/1	12/1		23
Vertebrate		11	11	7	16	4	24	22	22	10	7	27	2	38		50

occurs in only two units and a large phalanx referred to swan (Cygnus sp.) was also found in one of these two units. Highly fragmented remains from large birds were found in 11 of the levee transect units suggesting that either turkey or large waterfowl were possibly widely distributed but poorly preserved.

Turtle shell although widely distributed was also highly fragmented making identifications difficult. Several carapace fragments from three levee transect units were referred to alligator snapping turtle on the basis of thickness and size. Most of the turtle fragments came from Levee Transect Units 6, 7, and 8 and included the common snapping turtle (one unit), the red-eared turtle (one unit), three-toed box turtle (three units), and softshell turtle (two units).

Fish bones were widely distributed in the levee transect units but again reflected a low diversity assemblage. The fish assemblage is clearly dominated by gar. Gar occurs in 13 levee transect units and consists largely of ganoid scales. Two skull elements were definitely attributed to the shortnose gar. Three elements from three different levee transect units were referred to alligator gar on the basis of their large size but these remains could possibly derive from a large female longnose gar where lengths of at least 1.4 m have been recorded (Pflieger 1975:71). Gar are largely represented by ganoid scales and vertebrae; other elements represented include: suboperculum, cleithrum, circumorbitals, dentaries, basioccipitals, frontals, parietals, maxilla, premaxilla, dermosphenotic, endopterygoids, pterotics, preopercles, and other characteristically textured skull elements. The only other widely distributed fish is the bowfin found in nine levee transect units. Bowfin are represented by vertebrae and skull elements including suborbitals, cleithra, postcleithrum, operculum, suboperculum, pterotics, ceratohyal, and indeterminate textured skull fragments, and a branchiostegal ray. Other fish including pike or pickerel, smallmouth or black buffalofish, yellow bullhead, and freshwater drum were only sparsely represented.

Fragments from freshwater mussel shells occurred in six levee transect units. All specimens were highly fragmented and poorly preserved precluding identification beyond the class level. Terrestrial gastropods were only recovered in the macrofauna from two levee transect units.

Overbank Midden

Macrofauna from a midden deposit was also analyzed for the overbank midden deposit in S48.77 E157. Only a small sample of faunal remains was available from this area of the site. These data are summarized in Table 15-4. Fragments from large mammal bone also predominate in this area of the site. We were conservative in our estimates of body size for mammals and thus many of the bones attributed to the medium mammal category could actually derive from a large mammal such as deer. Fauna in this midden deposit is similar to that in the levee transect area midden in terms of fragmentation and representation of taxa. The sample is too small to offer additional interpretations.

Table 15-4. Macrofauna from two midden locations at the Cedar Grove site (#fragment/MNI)

Taxon	Overbank Midden S48.77 E157	Caddo III Midden
Pelecypod		4
Tritogonia verrucosa		1/1
Lepisosteus sp.	1/1	2/1
Turtle	1/1	5
Trionyx sp.		2/1
Large bird		2/1
Anas carolinensis		2/1
Small mammal		1
Medium mammal	81	6
Large mammal	51	44
Mammal		3
Didelphis virginiana	2/1	1/1
Sciurus carolinensis		1/1
Cervus/Odocoileus	1	
Odocoileus virginianus	2/1	5/1
Vertebrate	1	20

Features

Macrofauna from all Priority 1 features (F3-7, 9-21) was analyzed. No macrofauna was present in Features 7, 12, and 21. Numbers of fragments and MNI estimates for taxa are presented in Table 15-5. Although bones buried in pit features are sometimes better preserved than those recovered in more open midden context (Styles 1981), this was not as obvious at the Cedar Grove site. Bone from pit features was highly fragmented with most specimens consisting of less than half the original element. Some specimens exhibited the same black staining that was noted for midden deposits. Gnawing, which will be discussed later, was noted on fewer elements from the features suggesting that faunal remains in features were subjected to fewer destructive processes. Distribution of fauna for the overall feature assemblage will be considered first and then individual features will be described.

The feature assemblage, like the midden assemblage, is dominated by mammal bone. However, deer is perhaps less abundant than in the midden assemblage. Deer definitely occurs in only four features (F11, 13, 15, and 17). However, antler fragments attributed to either deer or elk occur in four features and large mammal fragments occur in seven features. If we combine the deer, deer or elk, and large mammal categories, then deer potentially occurs in eight out of 15 features. The medium mammal category, which was used conservatively in this report, may also contain highly fragmented deer elements. Nine features yielded mammalian remains which were placed into the medium size category. As was the case for the midden, other mammals are only sparsely distributed. Swamp rabbit occurred in two features, the eastern cottontail in one, and unspecified rabbit remains occurred in two features. On the whole, rabbit remains were found in three features. Canid remains were found in two features, both of which represented dog burials. Raccoon, bear, gray squirrel, mole (Scalopus aquaticus), and hispid cotton rat (Sigmodon hispidus) were recovered in one feature each. Human remains in the features consisted of one upper incisor from a juvenile recovered in Feature 4. This may be from Historic Burial 12 which was adjacent to Feature 4.

Birds were again sparsely represented with turkey occurring in the most features (4). Canada goose occurred in two features, with two additional goose elements attributed to either Branta or Chen were recovered in one of those features. Highly fragmented elements from large birds were found in six features suggesting that bones from large birds may have been more widely distributed but were poorly preserved. Two hawk (Buteo sp.) elements were recovered in a single feature.

Turtle elements were less widely distributed than in the midden. Turtle shell fragments occurred in only four features. Most of the elements were attributed to box (Terrapene sp.) turtle with three-toed box turtle definitely occurring in two features.

Fish were sparsely represented in feature deposits. Gar occurred in five features and were represented by skull elements and ganoid scales. Three skull elements from Feature 17 were referred to the alligator gar on the basis of their large size. Other skull elements present in this feature included fragments from a dentary, maxilla, and subopercles. One skull element from Feature 11 was referred to the shortnose gar. Ten additional skull elements including frontals, endopterygoids, dentaries, and maxilla,

Table 15-5. List of macrofauna from the features at the Cedar Grove site (#fragments/MNI)

Taxon	Feature 3	4	5	6	9	10	11	13	14	15	16	17	18	19	20	21
Gastropod			1													104
Pelecyopod				1			4			1		18	30			4
Megalonaias gigantea												1/1				
Large fish							2									
Fish								1	2	1			3			1
Lepisosteus platostomus							1/1									
Lepisosteus spatula												3/2				
Lepisosteus sp.				1/1			10/3		1/1			14/2	6/1			
Amia calva									1/1			1/1	2/2			
Ictalurus punctatus										1/1						
Large Catostomidae										1						
Catostomidae								1								
Micropterus punctulatus													1/1			
Micropterus salmoides													1/1			
Micropterus sp.												1/1				
Turtle										6		7	4	1		
Terrapene sp.										1/1						
Terrapene carolina										8/1			1/1			
Medium bird							12									
Large bird	1						4		1	23		17	21			
Bird	3/1						5			2			1			
Medium Anatidae									1				3			
Branta canadensis	3/1									2/1						
Branta/Chen sp.										1/1			2/1			
Buteo sp.													2/1			
Meleagris gallopavo							1/1			3/1		7/1	6/1			
Small mammal						1										
Medium mammal	1	47			1	339	2			1		3	8		4	
Large mammal					1		13	1			1	12	15		6	
Mammal		404														
Scalopus aquaticus												1/1				
Homo sapiens	1/1															
Sylvilagus aquaticus							2/1						1/1			
Sylvilagus floridanus													4/1			
Sylvilagus sp.						2/1			1/1							
Sciurus carolinensis												1/1				
Sigmodon hispidus							2/1									
Canis sp.		36/2				24/1										
Ursus americanus													1/1			
Procyon lotor													4/1			
Cervus/Odocoileus sp.							2/1					6/1	11/1		16/1	
Odocoileus virginianus							5/1	1/1		28/1		1/1				
Vertebrate	1	25 g		1		4 + 10 g	1				1	6	31			

and textured fragments were recovered in this same feature. Bowfin was second in abundance occurring in three features. Bass occurred in two features with the spotted bass (*Micropterus punctulatus*) and the largemouth bass (*M. salmoides*) both represented in one feature. Suckers (Catostomidae) occurred in two pits and a single element attributed to channel catfish (*Ictalurus punctatus*) was recovered in one pit. Highly fragmented fish elements occurred in a total of seven features. We had expected that preservation of fish elements and hence the density of fish bones would be higher in feature context due to more rapid burial and protection from weathering and scavenging; however the small sample of excavated features and the overall low abundance of bone in features precludes testing of this proposition.

Freshwater mussels were not abundant in features either. Pelecypod valve fragments were recovered in five features. Only one highly fragmented valve was well preserved enough for identification and it was referred to the washboard (*Megalonaias gigantea*). Terrestrial gastropods were represented by one whole valve recovered in Feature 5.

Bone tallies from most features are so low that they provide little information on the distribution of human activities across the site. However, brief comments on each feature are provided below.

Feature 3, Caddo Structure 1, contained an abundance of faunal remains, but most of these occurred in features within the structure. Faunal remains generally associated with Feature 3 included goose elements one of which was attributed to the Canada goose and scraps of indeterminate mammal and vertebrate bone. Possible floor depressions in the midden within this structure (Features 14 and 15) also yielded fauna. Features 14 contained seven bone fragments from large bird, duck, rabbit, gar, and bowfin. The other floor depression, Feature 15, yielded a large quantity of faunal material including elements from Canada goose, turkey, sucker, channel catfish, deer, and three-toed box turtle. It is interesting that deer is represented only by 28 fragments of antler. A bell-shaped pit within this structure, Feature 17, yielded an abundance of faunal material. The diversity of taxa present in this feature is high when compared to other types of deposits. Taxa present include turkey, bowfin, gar, bass, deer, deer or elk, mole, gray squirrel, freshwater mussel (including a washboard fragment), and turtle. A single shed antler is the only element definitely attributed to deer. Deer or elk is also represented by other antler fragments. Feature 18,

is also represented by other antler fragments. Feature 18, a possible hearth which was found inside the structure, also yielded an abundant and diverse accumulation of bone. Taxa present included goose, hawk, turkey, bowfin, gar, spotted bass, largemouth bass, deer or elk, raccoon, eastern cottontail, swamp rabbit, bear (pendant), freshwater mussel, and three-toed box turtle. Although fragmented large mammal bone is present in this feature, deer or elk is again represented by antler fragments. Most of the faunal remains derived from feature deposits are associated with features within the bounds of the Caddo structure designated as Feature 3.

Two features contained the remains of dog burials. Except for a single human tooth, all fragmented bone from Feature 4 can probably be attributed to the once articulated dog skeleton. Due to the high degree of fragmentation it was only possible to attribute 36 bone fragments to Canis sp. Elements recognized in the remains included mandibles, upper and lower teeth, vertebrae, humerus, radius, phalanges, a podial, and a sesamoid. The other dog burial, Feature 10, also contained poorly preserved, fragmented remains that could only be attributed to Canis sp. Elements present included premaxilla, mandibles, upper and lower teeth, auditory apparatus, vertebrae, ribs, sternabrae, humeri, radius, ulna, femora, tibiae, podials, metapodials, sesamoids, phalanges, and claws. Also present in this feature were elements attributed to swamp rabbit.

A series of pits, which were previously classified as undifferentiated pits (F5-7, 9, 12, and 13), all yielded depauperate faunal assemblages. Feature 5 only yielded a single terrestrial gastropod. Feature 6 yielded four pelecypod fragments, one gar scale, and two scraps of indeterminate bone. Feature 7 contained no macrofauna. Feature 9 yielded one fragment of medium mammal bone and one fragment of large mammal bone. No macrofaunal remains were present in Feature 12. Feature 13 yielded a fragment of a deer scapula, an awl made from large mammal bone, a sucker skull element and one indeterminate fish bone.

Feature 11, classified in the field as an animal bone cache, yielded an abundance of animal bone. Taxa present included turkey, gar, deer, hispid cotton rat, and freshwater mussel valve fragments. Deer is represented by whole elements including a right femur, a left femur, and a left radius. A large portion of a right radius and fragments from a right tibia were also present. Antler fragments attributed to deer or elk were also recovered. The presence of large fragments and whole elements in this feature is distinctive.

Features 16 and 19 yielded few faunal remains. Feature 16, a pit, only yielded seven highly fragmented vertebrate remains and one bone attributed to large mammal. Feature 19, a possible floor depression, contained only a single fragment of turtle shell.

Feature 20, a hearth, yielded 16 fragments of calcined antler, nine fragments of calcined large and medium mammal bones, and one piece of unburned medium mammal bone. Feature 21, a floor depression in the midden, contained pelecypod fragments, a fish bone, and an accumulation of terrestrial gastorpods. The abundance of snails in this feature is analogous to that noted for some burials.

The features within Caddo Structure 1 (F15, 17, 18) and the animal bone cache (Feature 11) contained the best preserved remains encountered in the feature assemblage. The features within the house show less deer than the midden deposits and also show high diversity. This suggests that there may be differential disposal of animal bones in midden and feature deposits, at least for those features located within house structures. However. a larger sample of feature fauna would be needed to document this pattern.

Burials

The Burial assemblage provides an interesting contrast to the assemblages recovered in feature and midden context. Faunal remains were recovered with all 15 burials and these data are summarized in Table 15-6. Deer bone was recovered in five burials and deer or elk antler was recovered in four burials. Indeterminate fragments of medium and large mammal bone were lightly scattered in ten burials. Other mammalian remains were not widely distributed. A proximal fragment from a bear ulna was found in Burial 7 and three fragments from swamp rabbit were found with Burial 4. Two fragments from rice rat were found with Burial 2. Eastern gray squirrel was found only with one burial, Burial 8, but a nearly complete skeleton was present. Miscellaneous human elements were included with the macrofauna from four burials. Bird bones although not widely distributed with burials included a relative complete bald eagle (Haliaeetus leucocephalus) in Burial 2 and a humerus fragment with Burial 3. Turkey was recovered with only one burial. Most of the large bird bones recovered with the burials were probably part of the bald eagle skeleton recovered in Burial 2. Fish associated with burials are again dominated by gar. Gar occurred with seven burials with skull elements, vertebrae, ribs, rays and spines, and ganoid scales represented. Bowfin occurred with only two burials with only two elements present. Gizzard shad (Dorosoma cepedianum) occurred with one burial. Smallmouth or black buffalofish (Ictiobus niger/bubalus) occurred with one burial and bigmouth buffalofish (I. cyprinellus) occurred with one burial; two additional sucker elements occurred in one of these burials. The occurrence of freshwater mussels is markedly different than in features and middens. Better preserved specimens often representing complete valve halves are present. Pelecypod remains were found with 13 out of 15 burials. The pocketbook (Lampsilis ventricosa) was associated with three burials, the buckhorn (Tritogonia verrucosa) with two, and the remaining taxa, including the floater (Anodonta grandis), the floater or stout floater (Anodonta grandis/corpulenta), the heel-splitter (Anodonta suborbiculata), the yellow sand-shell or the slough sand-shell (Lampsilis anodontoides/fallaciosa), the slough sand-shell (L. fallaciosa), the fat mucket (L. siliquoidea), and a paper shell (Leptodea sp.) all occur with one burial each. Marine gastropods including Busycon sp. were found with three burials. Additional marine shell artifacts not reported in Table 15-6 are described by Kay (Chapter 13). These artifacts from Burials 3, 4, 5, 6, 7, 9, and 10 were not submitted to the Illinois State Museum for taxonomic identification.

The infant comprising Burial 1 was interred with a freshwater pelecypod valve; generic or specific identification of the valve was not possible. The skeleton associated with Burial 2 is that of a bald eagle. Most, if not all, of the eagle skeleton was present. Elements recognized in the remains included the frontal, mandible, sternum, furculum, coracoid, scapula, humeri, ulnae, femora, tibiotarsi, carpometacarpi, radiale, ulnare, pollex, phalanges, and vertebrae. Many fragments classified as large bird were probably from the eagle skeleton. Fragments of a turtle carapace from an aquatic turtle (Chrysemys sp.) showed signs of grinding and two drill holes. These may be the fragmentary remains of a grave good. Other animal remains including the bones from small suckers and from the rice rat may represent incidental occurrences due to the excavation of the grave into midden fill or to the use of midden fill for filling in the hole.

The adult female comprising Burial 3 was interred with three mussel shells, one of which (Figure 10-3c) could be referred to Lampsilis sp. The bald eagle humerus fragment may have been an intentional grave good. The only other intentionally placed faunal grave goods that were recovered, were 113 shell beads, only 38 of which were submitted to the Illinois State Museum for analysis. These specimens were classified as marine gastropod fragments.

Table 15-6. List o. macrofauna from the burials at the Cedar Grove site. (#fragments/MNI)

Taxon	Burial Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Marine gastropod			38												
Busycon sp.					1/1				1/1						
Terrestrial gastropod			1	2	1	9	23		p	p					33
Pelecypod	14	3	41	5	2		40	13	3	19		1		13	5
Megalonaias gigantea				1/1											
Tritogonia verrucosa									1/1	1/1					
Anodonta grandis							1/1								
Anodonta grandis/corpulenta										1/1					
Anodonta suborbiculata									1/1						
Lampsilis anodontoides/fallaciosa									1/1					2/1	
Lampsilis fallaciosa										1/1					
Lampsilis siliquoidea				1/1											
Lampsilis ventricosa					1/1				1/1					1/1	
Lampsilis sp.			1/1												
Leptodea sp.				1/1			1/1								
Small fish		9								2					
Fish		3			1				230+6 g	42					7
Lepisosteus sp.		3/1			1/1		2/1	3/1	1539/1	511/1				1/1	
Amia calva						1/1									1/1
Dorosoma cepedianum									40/1						
Ictiobus niger/bubalus		3/1													
Ictiobus cyprinellus															1/1
Ictiobus sp.		1													
Ictiobus/Carpiodes sp.		1/1													
Turtle									2	1					
Chrysemys sp.		11/1													
Medium bird		5													
Large bird		334					2			1					
Bird		30					2								50
Meleagris gallopavo															1/1
Haliaeetus leucocephalus		53/1	1/1												
Small mammal		1	1					1							1
Medium mammal	3				2	2		1						1	
Large mammal			1	2			1			1			2		
Homo sapiens			1/1			3/1	2/1					1/1			
Sylvilagus aquaticus				3/1								7/1			
Sciurus carolinensis								122/1							
Oryzomys palustris		2/1													
Ursus americanus							1/1								
Cervus/Odocoileus							1/1			2/1		1/1		3	
Odocoileus virginianus				1/1	1/1			1/1	1/1					4/2	
Vertebrate		42+ 45 g	6+ 3 g	5+ 4 g	2+ 2 g		2+ 2 g	[illegible]	11+	4+	p	10+ 18 g	2	1+ 4 g	72+

The adult female in Burial 4 was buried with an assortment of faunal materials. Three mussel shells, a washboard made into a hoe (Figure 10-4f), a fat mucket (Figure 10-4e), and a paper shell (FSN 1540, not shown in illustration) represent grave offerings. She was also buried with shell ear discs and conch shell beads which were not examined at the Illi..is State Museum. Other faunal remains associated with this burial probably represent incidental occurrences.

Burial 5, an adult male, was associated with a conch (*Busycon* sp.) bead necklace. Only one of these beads was examined at the Illinois State Museum. This individual was also interred with a pocketbook valve. Other faunal remains are probably not intentional grave goods.

Burial 6, an eight year old child, was associated with few faunal remains. The fragmentary terrestrial snail (Gastropoda) remains and other bones probably do not represent grave goods. The conch shell ear pendants recovered with this burial were not examined at the Illinois State Museum.

The adult male associated with Burial 7 was buried with an interesting assortment of faunal materials. Items included are mussel shell (Figure 10-7a), a paper shell valve (Figure 10-7c), a floater valve (Figure 10-7d), two deer or elk antler projectile points, and a fragment from a black *bear ulna*. *A conch shell cup was also present* but was not submitted to the Illinois State Museum. The nonhuman bone (FSN 1138) listed in Figure 10-7 inventory remains an anomaly. In our analysis, we referred to it as human, but were unsure of this identification.

Burial 8, an adult male, was also interred with an interesting assortment of faunal materials. Mussel shells listed as grave goods in the Burial 8 inventory (Figure 10-8c-f) could only be identified as freshwater mussels. A deer ulna punch (Figure 10-8a) represents an intentional grave good as does a complete skeleton of an eastern gray squirrel (Figure 10-8b).

The elderly male in Burial 9 was also interred with a rich assortment of faunal materials. The fish skeleton found across the left arm and ribs (Figure 10-9b) actually contained bones from two different species, gar and gizzard shad. The fish skeleton on the left arm (Figure 10-9c) was from a gar. Freshwater mussels intentionally interred with this individual included a pocketbook, a *yellow or slough* sand-shell, a buckhorn, and a heel-splitter. Two bone discs fashioned from bone (probably mammal bone) were also present as was a conch shell ear pendant. An additional conch shell ear pendant was not examined at the Illinois State Museum.

The 12 to 15 year old juvenile in Burial 10 was also buried with an assortment of faunal materials. The fish (Figure 10-10c) placed on his forehead was a gar. The mussel shells interred with him included a floater (Figure 10-10b), a buckhorn (Figure 10-11q), and a slough sand-shell (Figure 10-11o). Two antler projectile points attributed to deer or elk were also present. The conch shell pendant necklace specimens were not submitted to the Illinois State Museum for identification.

The adult female interred in Burial 11 was not associated with any identifiable vertebrate remains.

The adult male in Burial 12 was buried with a mussel shell (Figure 10-13e) which could not be identified to taxon, a mandible from a swamp rabbit, and an antler projectile point attributed to deer or elk.

The nine month old infant in Burial 13 was not associated with any identifiable grave goods made from faunal materials.

Burial 14, an adult male, was interred with four deer ulna punches and three antler flakers attributed to deer or elk. He was also buried with a pocketbook mussel shell (Figure 10-15a) and two yellow or slough sand-shells (Figure 10-15h) which articulate.

The six year old child interred in Burial 15 was probably not intentionally interred with faunal materials. The remains recovered in the grave fill included bowfin, bigmouth buffalofish, turkey, turtle, small mammal, pelecypod, and terrestrial gastropod fragments which probably derived from the use of occupation debris during the construction of the grave.

Faunal remains in grave context differ from those in midden and feature context in the higher frequency of artifacts and in the higher frequency of pelecypod remains.

Caddo III Midden, Cedar Grove I Component

Faunal remains were well preserved in the earlier Caddo midden at the Cedar Grove site. However, since this midden was only sampled in a single 3 m test unit, only a small sample was available for analysis. These data are presented in Table 15-4. White-tailed deer, gray squirrel, and opossum were all present, and fragments from large mammal bones again dominated the assemblage. The only bird represented was a green-winged teal (Anas carolinensis). Aquatic taxa included a single gar, one softshell turtle, and one buckhorn mussel shell fragment. Low counts preclude detailed interpretations of this midden assemblage.

MICROFAUNA

Small scale faunal remains were examined from fine screen and flotation samples (both 1 mm mesh and .4 mm for flotation light fraction). Microfauna from midden was characterized through examination of fine screen and flotation samples from levee transect units.

Two fine screen samples were analyzed for each levee transect unit except Units 7 and 11 where only one sample could be located for each. Overburden samples were included for Units 0, 1, 3, 4, and 12 to see if overburden differed from undisturbed midden. Counts for undisturbed midden are provided in Table 15-7. No faunal remains were found in the fine screen samples from Levee Transect Units 2 and 11.

Mammal bones were scarce in fine screen samples, but some new small-bodied species were added to the midden assemblage including southern short-tailed shrew (Blarina carolinensis) represented by a partial skull in Levee Transect Unit 10 and eastern woodrat (Neotoma floridana) in Levee Transect Unit 8. Other mammalian taxa were represented by additional elements in the macrofauna.

Birds, turtles, and amphibians were all sparsely represented in the fine screen samples. Fine screen samples added some fish taxa to the midden assemblage including small minnow (Cyprinidae) from Levee Transect Unit 8, bass (Micropterus sp.) and a white or yellow bass (Morone sp.) from Levee Transect Unit 6. As was the case for macrofauna, gar and bowfin predominate. Pelecypods and terrestrial gastropods occur in four levee transect units each replicating their distributions in macrofauna.

Table 15-7. List of microfauna recovered from fine screen samples from levee transects at Cedar Grove (counts/MNI)

Taxon	Levee Transect										
	0	1	3	4	5	6	7	8	9	10	12
Gastropod				1		5		11			1
Pelecypod			2	51			1	3			
Fish		1				21		45			
Lepisosteus sp.	2/1	3/1	3/1	3/1	10/1	19/1	9/1	310/1	1/1	12/1	39/1
Amia calva	1/1	1/1						4/1		3/1	
Small Cyprinidae								1			
Centrarchidae											1
Micropterus sp.						1/1					
Morone sp.								1/1			
Aplodinotus grunniens							1/1	1/1			
Amphibian											1
Turtle								5		1	
Chrysemys sp.							1/1				
Medium bird							1				
Bird						1					
Small mammal							7				2
Medium mammal										2	
Large mammal											1
Blarina carolinensis										10/1	
Sylvilagus sp.			1/1				1/1				
Sciurus sp.								1/1			
Neotoma floridana								1/1			
Peromyscus sp.								2/1			1/1
Oryzomys palustris								1/1			
Odocoileus virginianus							1/1	1/1			

The overburden samples, although possibly contaminated with more recent debris, contained black or smallmouth buffalofish (LTU0), gar (LTU0, 1, 3, 12), indeterminate fish (LTU3), hispid cotton rat (LTU0), large mammal (LTU4), and terrestrial gastropods (LTU0).

Flotation samples from Levee Transect Units 8 and 11 (one sample each) predominately contained gar scales (Table 15-8). An additional flotation sample from the overburden in Levee Transect Unit 11 (not summarized in Table 15-8) contained terrestrial gastropods, large mammal, and gar.

Microfauna from features was examined through analysis of flotation samples from 13 features. Features 5, 12, and 16 contained no identifiable faunal remains. Counts and MNI for feature microfauna are presented in Table 15-9. Mammals are sparsely represented in feature microfauna. Rabbit bones (Sylvilagus sp.) were added to the Feature 11 tallies as were mouse bones (Peromyscus sp.). Human remains were added to two features and included a phalanx and an unidentified element in Feature 15 and a third phalanx from a juvenile in Feature 18. Bones from small mammals were recorded in five features but they could not be identified more precisely. Birds were sparsely represented; a hawk (Buteo sp.) was added to the Feature 18 assemblage.

Table 15-8. List of microfauna recovered from float samples from levee transects at the Cedar Grove site (#fragments/MNI)

Taxon	Transect 8	Transect 11
Gastropod	1	
Fish	12	
Lepisosteus sp.	90/1	11/1
Turtle	5	
Small mammal	1	
Mammal	1	
Small rodent	1	
Odocoileus virginianus	1/1	

Some notable additions were made to the reptiles including bones from green anole (Anolis carolinensis) in Features 6 and 15 and the presence of lizard elements in a total of four features. Some additions were also made to the feature fish assemblage including black bullhead (Ictalurus melas) in Feature 11, bigmouth buffalofish (Ictiobus cyprinellus) in Features 14 and 18, sunfish (Lepomis sp.) in Features 6, 14, and 18, and crappies (Pomoxis sp.) in Feature 18. Although gar and bowfin still occur in the most samples, flotation from features increases the overall picture of diversity in the utilization of fish at the site. Terrestrial gastropods are also more abundant in flotation samples reflecting the small size of most specimens.

Flotation from burials (Table 15-10) adds little to previous interpretations based on macrofauna. Mammals, other than humans, are sparsely represented in the microfauna. Birds and turtles are also rare. Fish are clearly dominated by gar. Microfauna from burials consists primarily of terrestrial gastropods, pelecypod fragments, gar scales, and other fish elements.

MODIFICATION OF BONE

Human and animal modification of faunal remains were examined from a series of vantage points. Burning,

Table 15-9. List of microfauna recovered from float samples from features at the Cedar Grove site (#fragments/MNI)

Taxon	Feature 6	7	9	10	11	13	14	15	18	20
Gastropod	1		8		26	1	2	10	4	2
Pelecypod	12		11		53	1	7	1	2	
Large fish					2					
Fish	34	28	111		16	10	28	72	5'	3
Lepisosteus sp.	18/1	16/1	97/1		52/1	22/1	56/1	29/1	72/1	
Amia calva	1/1				5/1	1/1	2/1		9/1	
Ictaluridae							1			
Ictalurus melas					1/1					
Ictiobus cyprinellus							1/1		2/2	
Ictiobus sp.							1/1			
Centrarchidae			2				2	2		
Lepomis sp.	2/2						3/1		1/1	
Pomoxis sp.									2/2	
Frog/toad		21				1				
Turtle		4	4		1			4		
Lizard	11		1		1					
Anolis carolinensis	6/1							1/1		
Snake					1		2			
Medium bird								1		
Large bird					6					
Buteo sp.									1/1	
Medium Anatidae							1			
Small mammal			1		3		2	1	2	
Medium mammal				1	2	4	1	16		
Large mammal				1				1		
Homo sapiens								2/1	1/1	
Sylvilagus aquaticus				1/1					2/1	
Sylvilagus sp.					2/1					
Small rodent			1						6	
Peromyscus sp.					2/1					
Oryzomys palustris					2/1					

Table 15-10. List of microfauna recovered from float samples from burials at the Cedar Grove site (#fragments/MNI)

Taxon	Burial 1	2	3	5	7	8	9	10	11	12	13	15
Gastropod	2		14	3	10	1	21	69	2	1	1	1
Pelecypod	6		9		37	1	7	18	1	18		
Fish	5	2		37		1	109	57	1	2	49	1
Lepisosteus sp.	9/1	13/1	12/1	32/1	26/1	7/1	566/1	255/1	2/2	1/1	1/1	1/1
Amia calva											4/1	
Catostomidae				1								
Ictiobus sp.		1/1										
Centrarchidae	1			1								
Aplodinotus grunniens					1/1							
Frog/toad				5								
Turtle			1					2				
Trionyx sp.			1/1									
Medium bird						3						
Passeriformes									1			
Small mammal	2				1							
Medium mammal		1				4						
Large mammal							3					
Homo sapiens	12/1							12/1	1/1		1/1	1/1
Sylvilagus floridanus								1/1				
Sciurus carolinensis								1/1				
Sciurus sp.				1/1				1/1				

gnawing, and human processing marks from skinning, butchering, and artifact manufacture were recorded for each bone element.

Burning

Frequencies of burned bone in midden, features, and burials for each class of animal are summarized for macrofauna in Table 15-11. Much of the bone from the Cedar Grove site was stained with a black deposit (probably manganese) which made determinations of burning difficult. The possibly burned category may largely contain specimens which were stained rather than burned. The category of differential burning predominately includes items which were only lightly burned. Heavily burned specimens were placed in the burned black or calcined categories.

Patterns of burning are not clearcut; however, some generalizations are possible. Most of the remains in midden deposits are burned. Most of the mammal bone in the midden is heavily burned (black or calcined). The fish bone in the midden largely shows light burning (differential). The midden, which clearly represents secondary refuse accumulation, contains bones in all states, but much of the bone was probably burned as a means of garbage disposal before its final incorporation in the midden. In features most of the mammal bone is unburned; whereas, fish bone is burned with both calcining, heavy burning (black), and light burning (differential) all present. Bird and turtle remains in features are generally calcined. The heavier burning noted for nonmammalian remains in feature context is problematic. Most of the faunal remains in burials are unburned with the exception of the fish remains which show a high percentage (83%) of light burning (differential). Perhaps the fish which were interred in these graves had been smoked or otherwise cooked.

Gnawing

Presence of tooth marks left by rodent and carnivore (probably dog) gnawing was recorded. Summaries of animal

Table 15-11. Frequency of burned bone from the Cedar Grove site (N = number of specimens)

Deposit	Taxon	Unburned N	%	Possibly Burned N	%	Burned Black N	%	Differential Burn N	%	Calcined N	%	Total
Midden	Gastropod	4	(100.0)									4
	Pelecypod	28	(100.0)									28
	Fish	61	(22.5)	6	(2.2)	42	(15.5)	155	(57.2)	7	(2.6)	271
	Reptile	41	(22.0)	8	(4.3)	76	(40.9)	34	(18.3)	27	(14.5)	186
	Bird	48	(34.5)	1	(0.7)	41	(29.5)	34	(24.5)	15	(10.8)	139
	Mammal	612	(27.2)	44	(2.0)	997	(44.2)	256	(11.4)	345	(15.3)	2254
Feature	Gastropod	1	(100.0)									1
	Pelecypod	13	(26.5)					36	(73.5)			49
	Fish	7	(12.5)	1	(1.8)	14	(25.0)	13	(23.2)	21	(37.5)	56
	Reptile	1	(3.6)	6	(21.4)	3	(10.7)	1	(3.6)	17	(60.7)	28
	Bird	7	(7.3)			22	(22.9)	1	(1.0)	66	(68.8)	96
	Mammal	929	(87.4)			24	(2.3)	12	(1.1)	98	(9.2)	1063
Burial	Gastropod	90	(100.0)									90
	Pelecypod	170	(96.6)			1	(0.6)			5	(2.8)	176
	Fish	262	(8.8)			228	(7.7)	2482	(83.4)	4	(0.1)	2976
	Reptile	13	(81.3)			3	(18.8)					16
	Bird	419	(86.4)	3	(0.6)	1	(0.2)	6	(1.2)	56	(11.5)	485
	Mammal	114	(82.6)	1	(0.7)	14	(10.1)	2	(1.4)	7	(5.1)	138

Table 15-12. Modification of macrofauna from the Cedar Grove site (N = number of specimens)

Deposit	Taxon	None		Carnivore Gnawed		Digested		Human Modified		Rodent Gnawed		Weathered		Total
		N	%	N	%	N	%	N	%	N	%	N	%	
Midden	Gastropod	4	(100.0)											4
	Pelecypod	28	(100.0)											28
	Fish	262	(96.0)	2	(0.7)							9	(3.3)	273
	Reptile	171	(93.4)	5	(2.7)			5	(2.7)			2	(1.1)	183
	Bird	125	(89.0)	7	(5.0)	1	(0.7)	3	(2.2)			3	(2.2)	139
	Mammal	1623	(70.2)	139	(6.0)	2	(0.0)	37	(1.6)	2.	(0.0)	508	(22.0)	2311
Feature	Gastropod	1	(100.0)											1
	Pelecypod	58	(100.0)											58
	Fish	54	(96.4)							1	(1.8)	1	(1.8)	56
	Reptile	28	(100.0)											28
	Bird	118	(99.2)									1	(0.8)	119
	Mammal	1050	(97.6)	1	(0.1)			4	(0.4)	1	(0.1)	20	(1.9)	1076
Burial	Gastropod	70	(77.8)					20	(22.2)					90
	Pelecypod	174	(98.9)							1	(0.6)	1	(0.6)	174
	Fish	2422	(81.4)									544	(18.6)	2976
	Reptile	5	(31.2)					11	(68.8)					16
	Bird	477	(99.6)	2	(0.4)									477
	Mammal	144	(90.6)					14	(8.8)			1	(0.6)	159

and human marks left on bone elements are presented by deposit type and class of animal in *Table 15-12*. Traces of carnivore gnawing were clearly most abundant in midden deposits with mammalian remains showing the highest percentage of gnawed elements. This probably reflects increased exposure of elements to destructive processes in more open midden deposits. Items recovered in feature and burial context showed lower frequencies of gnawing. Rodent gnawing was uncommon in all types of deposits.

Food Processing and Artifact Manufacture

Human modifications were most prevalent in the burial assemblage where the abundance of bone artifacts was much higher than in any other type of deposit. Counts and percentages of human modifications are presented in Table 15-12. The midden contained bone which was modified by human activities including food processing and artifact manufacture. Probable food processing marks were noted near the distal ends on two left humeri and on a right femur shaft from white-tailed deer. One metacarpal from white-tailed deer (FSN 109) had been worked into a chisel. The midden contained 16 pieces of worked deer or elk antler including two projectile points (FSN 677, 320) and one flaker (FSN 85). Two fragments of large mammal bone had been shaped into awls (FSN 112, 439) and two fragments of medium mammal bone showed striations (FSN 226, 439) possibly related to artifact manufacture. Cuts were noted on three other fragments of medium mammal bone and also on the proximal portion of a raccoon ulna. Turkey bones showed cuts on the proximal end of a carpometacarpus and on a left tibiotarsus shaft. The midden also yielded one drilled turtle peripheral.

The early Caddo midden yielded two fragments from bone artifacts which may have once fit together. These items, fashioned from mammal bone, showed long striations running their lengths. One piece has a bulbous end which has been ground. They may be from a decorative pin.

The features only contained four pieces of worked mammal bone including a large mammal shaft whittled to a point in Feature 7 (FSN 635-1), another whittled shaft in Feature 13 (FSN 631), a possibly ground fragment of large mammal bone in Feature 11, and a bear canine from Feature 18 (FSN 1379) which was apparently notched for suspension as a pendant.

The bone artifacts recovered with the burials were previously listed in this report and have been described by Kay (Chapter 13). Several items which were not analyzed by Kay included a right fibula from a medium mammal which showed striations recovered with Burial 14, and a series of ground, scraped and drilled turtle (Chrysemys sp.) pleurals from Burial 2. These pleurals probably once formed a part of a bowl or rattle.

RESOURCE SELECTION

The terrestrial fauna from the Cedar Grove site shows an emphasis on forest and forest edge exploitation as indicated by the remains of turkey and white-tailed deer. Both of these species would have been available yearround. Deer bone was generally too fragmented to provide reliable indications for the ages of individuals and the season of kill. Antler was also fragmented and usually did not include the basal portion at the articulation with the skull which could provide inferences of seasonality. The piece of antler in Feature 17 was shed during the winter. It could have come from a white-tailed deer kill or have been picked up after it was shed.

Other terrestrial species, although less abundant and less widely distributed than deer and turkey, also showed exploitation of forested areas particularly those along water bodies. Species in this category include raccoon and swamp rabbit. The paucity of semiaquatic mammals such as beaver and the absence of muskrat are surprising given the location of the site. Other forest animals were occasionally utilized including gray and fox squirrels, opossum, mink, eastern cottontail, and bear. Elk remains were rarely encountered as were those of bear. The paucity of remains from these two economically important food sources, suggests that they may not have been available near the site. Bison was also sparsely represented suggesting that they were not available near the site and/or that bones were not brought back to the Cedar Grove locality. Domesticated species, other than dog, were not found in good context at Cedar Grove, which indicates that it was unlikely that domesticates were exploited.

Other small mammals, which were sparsely represented and may or may not represent food items, also primarily indicate a woodland setting including southern short tailed shrew, mouse (Peromyscus sp.), and woodland vole. The semiaquatic rice rat would have been available in swamps and marshes near the site and hispid cotton rat would have been available in areas of forest edge. The occurrence of the eastern woodrat is somewhat surprising since they are currently rare in the bottomlands of the Gulf Coastal Plain; however, they do occur in brushy areas along bottomland

streams (Sealander 1979:174). Other terrestrial fauna taken from woodland settings included the three-toed box turtle and the green anole, as well as hawk (Buteo sp.) and bald eagle. Eagles must have been killed in the winter, but the remains of the individual interred in Burial 2 could have been curated for an unknown time period prior to their incorporation in the grave.

The low amount of waterfowl on the site is also surprising. Canada goose occur in midden and feature deposits suggesting that some activities took place during the winter months. A single element from a swan (Cygnus sp.) may also mark winter activities. Ducks are underrepresented given the location of the site. Green-winged teal recovered in the Caddo III midden (Cedar Grove I component) constitutes the only definitely identified duck remains from the site. This dabbling duck could have been procured in the spring or fall.

Turtles, although not abundant, include remains from a series of aquatic species including common snapping turtle, alligator snapping turtle, red-eared turtle, and softshell. Softshells may have been taken from the river and the alligator snapping turtle and red-eared turtle could have come from quiet stretches in the river or associated lakes. The common snapping turtle is cosmopolitan in distribution. Turtles apparently did not constitute a major portion of the diet.

Fish, especially gar, are ubiquitous at the site. Although sixteen different species are present in the site assemblage, only gar and bowfin occur in any abundance. The gar, including the shortnose and possibly the alligator gar, suggest an emphasis on quiet pools in the river or lakes (Pflieger 1975:69). The bowfin also suggests use of quiet pools, sloughs, and backwaters (1975:72). Both gars and bowfins commonly rise to the surface to renew the air supply in their swim bladders. They also both come into the shallows at night to feed (1975:72) and might have offered easy targets for Native American spear and bow hunters.

Size estimates for fish recovered at the Cedar Grove site are given in Table 15-13 by MNI within midden, feature, and burial contexts. Most of the fish recovered in the macrofauna are from medium and large sized individuals. Very large gars were dispatched by site inhabitants. Some of these may represent kills of large spring-spawning females who ventured into the shallows. However, the seasonality interpretation is tenuous since gars of all sizes also come to the surface to feed at night.

Presence of bigmouth buffalofish, largemouth bass, white or yellow bass, and freshwater drum, suggest that deep pools of larger rivers and lakes were also exploited. Other taxa indicative of quiet water in the river or lakes include black or white crappie, grass or chain pickerel, black bullhead and gizzard shad. Black or smallmouth buffalofish, yellow bullhead, and channel catfish, could have all been derived from sections of the river with current along with spotted bass which prefers flowing water in large streams and rivers (Pflieger 1975).

Given the diversity of fish available in the area, the concentration on gar and bowfin is surprising. The high representation of gar does not appear to be solely a function of preservation biases. Other taxa, especially suckers and catfish, also have dense skull elements which would have been preserved.

Analysis of flotation samples increased the diversity of fish in the site assemblage, and also increased the proportion of small individuals in the assemblage. However, the abundance of fish remains is still lower than anticipated given the setting of the site and studies of fish utilization in other riverine localities (e.g., Styles 1981). Fish were commonly used, but there does not appear to have been a definite emphasis on aquatic resources.

Table 15-13. Size of fish recovered from the Cedar Grove site. Size class are in cm. MNI is shown.

Taxon	Size Class	Ma fauna	Micro fauna
Midden			
Lepisosteus platostomus	88-96	1	
Lepisosteus spatula	192-200	2	
Lepisosteus sp.	40-48	2	
	48-56	2	
	56-64		1
	64-72	4	1
	80-88	1	
	88-96	2	
Amia calva	24-32	1	
	32-40	4	
	40-48	4	
	56-64	1	
Ictiobus niger/bubalus	32-40		1
	48-56	1	
Ictalurus natalis	24-32	1	
Micropterus sp.	24-32		1
Morone sp.	8-16		1
Aplodinotus grunniens	16-24	1	
	24-32	1	
	72-80	1	
Feature			
Lepisosteus platostomus	80-88	1	
Lepisosteus spatula	200-208	1	
	288-296	1	
Lepisosteus sp.	32-40		1
	40-48	1	
	48-56		1
	64-72		1
	80-88	1	
	88-96		1
	96-104	2	
	120-128	1	

Taxon	Size Class	Macro fauna	Micro fauna
Amia calva	0-8		1
	8-16		2
	32-40	2	
	40-48	1	
Ictalurus melas	16-24		1
Ictalurus punctatus	24-32	1	
Ictiobus cyprinellus	8-16		1
	32-40		1
	48-56		1
Ictiobus sp.	16-24		1
Centrarchidae	0-8		1
	8-16		1
Lepomis sp.	0-8		1
	8-16		3
Pomoxis sp.	8-16		1
	16-24		1
Micropterus punctulatus	16-24	1	
Micropterus salmoides	24-32	1	
Micropterus sp.	24-32	1	
Burial			
Lepisosteus sp.	40-48		1
	56-64	1	1
Amia calva	0-8		1
	24-3.	1	
	32-40	1	
Ictiobus cyprinellus	32-40	1	
Ictiobus niger/bubalus	0-8	1	
Ictiobus sp.	0-8		1
Centrachidae	0-8		1

Mussels were only commonly recovered in burial context at this site, and were not abundant. Mussels were procured from a variety of aquatic habitats including quiet waters in ponds, sloughs, and lakes (pond horn, floaters, slough sand-shell), streams and rivers with current (buckhorn, washboard, pocketbook), and quiet areas of streams and rivers (fat mucket, floaters) (Parmalee 1967). Although mussels were apparently valued as grave goods, they were rarely preserved in habitation debris and apparently did not represent important food items.

REGIONAL COMPARISONS

As indicated by Hemmings (1982) in his report on the late Caddoan occupation at the Spirit Lake site, little is known concerning late Caddoan faunal exploitation in the Great Bend Region. Hemmings reports (1982) that the following taxa were recovered at Spirit lake: white-tailed deer, raccoon, domestic dog, eastern mole, box turtle, cooter or slider, gar fish, and mussel shell. Deer predominated in the assemblage at this site and mussels were rare. The same pattern was noted at the Cedar Grove site.

As a part of the overall Cedar Grove faunal analysis, a small faunal assemblage from the nearby Sentell site, another late Caddoan occupation, was examined at the Illinois State Museum. These data are presented in Table 15-14. Although only a small sample of fauna was available for analysis, the assemblage is grossly similar to that noted for Cedar Grove. Domestic pig from the Sentell site came from a provenience unit which also yielded more recent historic debris (Trubowitz, personal communication 1983) detracting from the importance of this find.

Table 15-14. List of macrofauna recovered from screen samples from the Sentell site (3LA128)

Taxon	#fragments/MNI
Pelecypod	3
Fish	1
Turtle	1
Trionyx sp.	1/1
Large Mammal	7
Medium mammal	4
Sylvilagus sp.	1/1
Canis sp.	1/1
Sus scrofa	2/1
Cervus canadensis	1/1
Odocoileus virginianus	1/1
Vertebrate	1

At the Belcher Mound and village site along the Red River in northwestern Louisiana, Webb (1959:181) concluded that "deer provided the chief source of mammal food. . . ." He also noted that bear remains were rare and that bison was absent. This pattern was also noted at the Cedar Grove site where bison and bear were only sparsely represented. Webb lists six different fish taxa from Belcher. Gar was present, but freshwater drum was described as common. No quantification is offered so it is difficult to offer comparisons. Mussel shells were more abundant in habitation debris at Belcher (1959:180) than they were at Cedar Grove and different taxa were also present. These differences in fish and mussels may primarily reflect differences in proximal hydrologic settings.

The bone artifacts recovered in village and burial context at Belcher resembled those recovered from Cedar Grove. Present in the Belcher assemblage were deer ulna awls or punches, associated with a burial in one instance (1959:166), split bone awls, a bone chisel, bone discs, antler projectile points, other pieces of worked antler, bear canine pendants, conch shell vessels, marine shell beads, and mussel shell hoes (1959:166-175). Webb notes (1959:168) in this discussion of Burial Pit 5 that "many fragments of animal and fish bones" were scattered around some ceramic vessels. Accumulations of fish, bird, and other animal bones were also noted with other burials at Belcher. This suggests that animals, or portions of animals, were intentionally placed with the deceased most likely as food offerings. Potential food offerings were also noted for the Cedar Grove assemblage.

Swanton's (1942) summaries of early descriptions of the Caddo also provide another source for comparison. Swanton (1942:135) notes the importance of deer as a food item. He also provides excerpts which list other prey species including waterfowl, rabbits, prairie chickens, herons, cranes, "bustards", snakes, turkey, fish, bison, and bear. He surmises (1942:138) that "the essentially woodland character of the culture of these people is shown in the surprisingly large use made of fish." He further records (1942:138) that in 1719 the Kadohadacho along the Red River served La Harpe a feast of smoke-dried fish.

The Cedar Grove site differs from our expectations based on Swanton in that there appears to be more emphasis on deer and perhaps less emphasis on fish than would be expected. Although a wide variety of species were used, including waterfowl, medium and small sized mammals, turtles, and fish, the real subsistence focus appears to have been on deer. Turkey may also have constituted an important food item. Sparse occurrences of bison and bear suggest that the inhabitants of the Cedar Grove site sometimes used these animals, but not on a regular basis.

CONCLUSIONS

The Cedar Grove site provided a relatively well preserved faunal assemblage documenting late Caddoan subsistence practices along the Red River in southwestern Arkansas. Vertebrate and invertebrate remains were preserved in midden, feature, and burial contexts at the site. Contrasts in species distributions, burning patterns, gnawing, and human processing in these three contexts were observed and described in this report. Features within the Caddo Structure 1 (F15, 17, and 18) and a bone cache (F11) contained the best preserved faunal remains in the feature assemblage. With the exception of the bone cache, these features show less deer than the midden deposits and also show a higher diversity of species. The midden is clearly dominated by mammal bone with bones from white-tailed deer occurring in all levee transect units. The burial assemblage differs from midden and features in the greater abundance of freshwater mussel shell and in the higher frequency of bone and shell artifacts. Marine gastropods including conch shell artifacts occur only in burial context. Most of the faunal remains in the midden are burned possibly as a means of garbage disposal before their incorporation into the midden deposit. Midden remains also show higher frequencies of carnivore gnawing probably due to increased exposure to dogs in the more open midden deposits.

Although a diverse variety of species are present on the site, the assemblage is clearly dominated by white-tailed deer. Woodland environments near the site appear to have been the primary targets for subsistence activities. Both deer and turkey were widely distributed at the site. Waterfowl and aquatic turtles were also present but were not as abundant as the previous two species. Fish were widely distributed at the site and were clearly dominated by gar. Although fish, waterfowl, aquatic turtles, and semiaquatic mammals were all used, there does not appear to be an emphasis on the exploitation of aquatic resources. Abundances for aquatic and semiaquatic taxa are lower than have been noted for earlier prehistoric sites in major river valley settings. Freshwater mussels primarily

occurred in burial context suggesting that they were valued as grave goods but did not constitute important food items.

The faunal assemblage does not suggest emphasis on any particular season. In fact, there were few seasonal indicators in the assemblage. The green-winged teal in the early Caddo midden could have been taken in the spring or fall. The Canada goose and swan could have been procured in the winter. The bald eagle remains suggest a winter kill but these birds could have been curated and later interred. A single piece of shed antler could also reflect winter activities at the site. However, deer and turkey could have been procured yearround. Given resource availability in the area, there is nothing to suggest that occupants could not have stayed at the locality on a long term basis, either yearround or for multiple seasons. High waters in the spring might have caused short term abandonment. It is not possible to precisely define the season of occupation from the faunal remains.

This report documents for the first time a well preserved late Caddo faunal assemblage in the Red River Valley of southwestern Arkansas. The excavation strategies and recovery techniques have provided a collection of both macrofauna and microfauna which can be used as baseline data for further investigations of late Caddo faunal exploitation.

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Chapter 16

BIOARCHEOLOGY OF THE CEDAR GROVE SITE

by Jerome C. Rose

Caddoan bioarcheology has received a moderate amount of attention in the past, but there is as yet no synthetic summary. The major reason for this is that none of the bioarcheologists working with Caddoan skeletal series have made a long term commitment to Caddoan bioarcheology because of geographic distance from the Caddo area, lack of funds, and the paucity of problem-oriented archeology within the Caddo region. This situation has begun to change during the last ten years primarily because archeologists have adopted regional and ecologically oriented research programs that are beginning to generate hypotheses which are testable using bioarcheological data. The changing focus of Caddoan archeology will stimulate problem-oriented bioarcheological research that will in turn encourage the production of synthetic and well integrated Caddoan bioarcheology studies. It is hoped that the analysis of the Cedar Grove skeletal series will make a small contribution to this goal.

The primary purpose of the Cedar Grove bioarcheology study is to provide a comprehensive analysis of the prehistoric human skeletal remains from this site. This report is the product of applying the complete range of methodological and analytical resources available to the bioarcheologist to achieving six specific objectives. The first bioarcheological objective is to reconstruct the mortuary program and social organization of the Cedar Grove site. Demographic parameters, nonmetric skeletal traits, and dental morphology are used to determine this information. The second objective is to reconstruct the proportion of maize included in the Cedar Grove diet. Porotic hyperostosis, sexual dimorphism, dental pathology, and enamel microwear patterns are used to reconstruct the Cedar Grove diet, which is then compared to other Fourche Maline and Caddo skeletal samples. The third objective is to assess the adaptive fitness of the Cedar Grove culture within its specific ecological context and in relationship to other Fourche Maline and Caddo groups. Childhood probability of dying, indicators of childhood stress (i.e., Wilson bands), and paleopathology are used to estimate the level of adaptive efficiency at Cedar Grove. The fourth objective is to integrate the bioarcheological data with that obtained from the archeological, paleobotanical, and paleozoological analyses. The fifth objective is to integrate the demographic, dietary, and paleopathological analysis of the Cedar Grove sample with the extant bioarcheological literature of the Fourche Maline-Caddo sequence. The sixth and final bioarcheological goal is to determine whether there is any evidence of European contact at Cedar Grove in the skeletal series.

METHODOLOGY

All skeletal material was received at the Osteology Laboratory of the University of Arkansas directly from the field without any processing. Each burial was washed in a 50/50 solution of alcohol and water without immersion. The dentition and delicate skeletal features (i.e., pubic symphyses) were cleaned with 95% alcohol and a "water pik." All the dirt removed from the bones was waterscreened (3.2 mm hardware cloth) and examined for small skeletal elements as well as floral and faunal remains, which were separated for analysis by appropriate investigators. Additional skeletal elements (i.e., phalanges, sesamoid bones, etc.) were recovered by field flotation and waterscreening of the grave fill. In every case, the additional skeletal material was assignable to the appropriate individual. All skeletal elements were labeled with the appropriate accession numbers and all broken pieces were reconstructed. The burials were arranged in anatomical position for analysis. The burials were inventoried, and all observations and measurements (after Bass 1971) were then made while material necessary for specialized analysis (i.e., molars for microscopic observations; canines and incisors for histological analysis; and pathologies for photography and radiography) were separated out.

All human bone from nonburial areas were compared to the numbered burials for possible matches and those items not matching are listed at the end of the burial descriptions. Sex was determined using a modification of the procedures developed by Acsadi and Nemeskeri (1970). Each morphological and metric feature useful in sex determination was scored on a scale of +2 (hypermasculine) to -2 (hyperfeminine) and a weighted mean score was calculated to assign sex (see analysis forms, Appendix II). All criteria used for scoring were derived from the published literature (Acsadi and Nemeskeri 1970; Bass 1971; Brothwell 1972; Krogman 1962; Ubelaker 1978) and standardized by seriation of all Caddo skeletal material available in the University of Arkansas Osteology Laboratory. After matching the morphological traits (i.e., mastoid, linea aspera, etc.) to the sexing standards, the Cedar Grove skeletal material was seriated for each trait to assure internal consistency and to check for idiosyncratic variation. For example, the external occipital protuberance and associated muscle attachments cannot be used in sex determination among the Caddo because many females have well developed protuberances, which would have been classified as a male character in other populations. Reliability of each sex determination was assessed by grouping all recorded observations from each burial into four categories: (1) size and robusticity; (2) muscle attachments; (3) nonpelvic shape; and (4) pelvic morphology. Sex determination was considered reliable if two or more observations could be made from the pelvis and one other category. Sex determination was considered less reliable if observations were made from only two nonpelvic categories. No sex determination was attempted on individuals younger than 16 years of age.

Age determination of children employed dental development standards (Demirjian and Levesque 1980; Moorrees et al. 1963a; 1963b; Schour and Massler 1945; Sundick 1972). Long bone length-age regressions derived from the published literature (see Bass 1979 and Ubelaker 1978) were used to confirm one age estimate where the

dental data were not complete. Juveniles were aged by epiphyseal closure using published standards (Bass 1971; Brothwell 1972; Krogman 1962). Adults were aged by degenerative changes of the pubic symphysis using models for both males (McKern and Stewart 1957) and females (Gilbert and McKern 1973). Because these two techniques are most reliable in the younger age categories, the Todd technique, which consists of both photographs and written descriptions of the pubic standards, was also employed to prevent systematic underestimation of age (Todd 1920). In addition a technique based on the degenerative changes of the sacral surface of the ilium was also employed (Lovejoy, personal communication). The technique consists of a description and photograph for each five year adult age category. An age assignment was made only after all the above techniques were reconciled. Pelvic age criteria could be used in all but one case, where age was determined by dental attrition and suture closure. All crania from aged individuals were seriated by suture closure and dental attrition, and the unknown skull was then aged by the best fit into this series.

All bones were examined macroscopically and with the aid of a stereomicroscope for identifications of pathological lesions. Each lesion was diagnosed using comparative collections and the published paleopathology literature (e.g., Brothwell and Sandison 1967; Buikstra 1981; Steinbock 1976). Each lesion was described and photographed, prior to being radiographed and independently diagnosed using clinical radiographic interpretation. Final diagnosis resulted from mutual concordance of both the clinical and paleopathological interpretations. Periosteal reactions and porotic hyperostosis were classified as either active or healing using the criteria established by Mensforth et al. (1978).

All pathological lesions were grouped into etiological categories (i.e., infections, porotic hyperostosis, developmental anomalies, osteophytosis, osteoarthritis, trauma, and neoplasms) for epidemiological analysis and comparison with the published information from other skeletal collections. Where the published literature contained sufficient descriptions concerning the paleopathology of the Caddo and Fourche Maline, the diagnoses were altered to conform to the data from Cedar Grove.

The dentitions were inventoried and scored for caries, dental attrition, abscessing, calculus deposits, agenesis, antemortem exfoliation, and dental morphology. Each tooth was examined with a sharp dental explorer under good illumination, using a stereomicroscope where necessary. Caries were identified by penetration of the enamel surface by the dental explorer and recorded by tooth surface (i.e., occlusal, smooth surface, cervical, interproximal, and root) following the procedures of Moore and Corbett (1971). Adult caries rates were calculated by tooth type (e.g., molars), total observed teeth, and mean caries per individual. Quantification of dental attrition employed the Scott (1979) system which scores each molar occlusal surface quadrant from one to ten on the basis of the proportional area of enamel wear facets and remaining enamel when the dentin is exposed. The total score for each molar (which can range between 0 and 40) was determined by summing the scores of the four quadrants. Because there is, as yet, little comparative data using the Scott method, molar attrition was also scored using the Murphy (1959) system. This method requires matching the amount of dentin exposure to standardized drawings which have been assigned scores between zero and nine. Mean scores for each molar type (i.e., first, second, and third) were calculated for comparison with other skeletal series.

Abscesses were scored by the presence of observable drainage passages in the mandible and maxilla. Rates were calculated by abscesses per observable bone. Antemortem tooth loss was differentiated from postmortem loss by the presence of remodeling activity within the surface of the tooth sockets.

As a complement to the attrition analysis used in dietary reconstruction, the molar surfaces were observed with the scanning electron microscope (Rose et al. 1979; Rose 1981; Ryan 1979; Walker 1976; Walker et al. 1978). Ten mandibular second molars were selected for examination and cleaned in a sonic cleaner with alcohol. The crowns were removed from their roots, mounted on aluminum stubs, and coated with 17.3 nanometers of gold (P.I.I. sputtering system). The mesio-lingual cusp was marked and the specimen mounted in an I.S.I. 60 scanning electron microscope set at a beam angle of 15° and a voltage of 30 KV. Each mesio-lingual cusp was photographed (Polaroid type 55+/-film) at low magnification (i.e., 15-20X). The surface of each cusp was examined at 500 magnifications and two to four micrographs were taken at 1500 magnifications to represent the surface topography of the cusp. The procedures employed were standardized for comparability to the other skeletal populations previously studied in the University of Arkansas Osteology Laboratory. The number of striations were counted and their widths were measured with Helios dial calipers on the 1500 magnification micrographs. The enamel surface topography was described and compared to similar micrographs from other skeletal series.

The most reliable indicators of adaptive efficiency are childhood mortality and morbidity rates which could not be determined from the small subadult Cedar Grove sample. However, it has been demonstrated that histological defects observed in the enamel of adults can be used to reconstruct childhood morbidity patterns (Rose 1977, 1979; Rose et al. 1978; Lallo and Rose 1979). Eleven mandibular canines, one maxillary canine and eleven maxillary central incisors representing twelve individuals were selected for histological analysis. Each tooth was photographed and measured prior to embedding. The teeth were placed upon an epoxy (Buehler Epo-Mix Epoxide) platform within a disposable mold. The teeth were covered with epoxy and placed under vacuum until all bubbles were eliminated. The molds were placed in a pressure chamber at 50 psi nitrogen and maintained at 50° C for twelve hours. A longitudinal bucco-lingual cut was then made through the central axis of each tooth with a low speed diamond saw. The cut surface of the block was mounted with epoxy onto a frosted petrographic slide. The surplus section block was removed with the diamond saw leaving a 75 micrometer section affixed to the slide. The sections were thinned with 600 grit silicon carbide papers on a motorized grinder. Each section was polished with 6 micrometer diamond paste on a nylon cloth for 10 minutes, and then 0.25 micrometer diamond paste on texmet for 10 minutes using automated Buehler low speed polishers. Final polishing employed 0.05 micrometer alumina on a microcloth for one to three minutes. Each section was etched for 15 seconds in a one normal dilution of hydrochloric acid and rinsed in tap water prior to dehydration in 95% alcohol. Each section was examined for Wilson bands and hypoplasias at 160 magnifications using a Zeiss Standard 18 microscope equipped with both transmitted light and reflected light Nomarski optics. The criteria for defining Wilson bands and hypoplasias, as well as the data for calculating the age of incidence, are derived from Condon (1980).

Genetic variation both within the Cedar Grove sample and between Cedar Grove and other Caddoan skeletal series can be calculated using both metric and nonmetric (i.e., epigenetic) data. Because it has been demonstrated that Caddoan skeletal remains are frequently too fragmentary for metric analysis (Loveland 1980) only epigenetic data could be compared between Cedar Grove and other skeletal series. A total of 31 cranial and nine postcranial nonmetric traits were scored using the system developed by Buikstra (1976; personal communication). This system scores each trait as not observable, absent, or present in one to four possible variants. The Cedar Grove dentitions were scored for twenty morphological traits using the methodology and standard dental casts developed by Turner (1970; Turner and Hanihara 1977; Turner and Swindler 1978). Each trait was scored as not observable, absent, or present in one to nine possible variants.

RESULTS

The discussion of the collected data is preceded by a detailed description of each burial with a detailed tabular summary inventory available in Appendix XII. This approach has been adopted to facilitate comparison of the Cedar Grove skeletons with future analyses.

Burial Descriptions

Burial 1. (Figure 10-1) This infant, 12 to 18 months of age, was interred as a single primary burial in an extended supine position. The lower extremities (i.e., tibiae and fibulae) were removed during grave preparation for Historic Burial 49. The burial was additionally disturbed by stripping activities in preparation for archeological excavation. The skeleton is in a good state of preservation with the following skeletal components being represented: the right shoulder and arm; ribs and vertebrae; pelvis; both femora; occipital fragments; and most of the mandible. The right humerus shaft shows periostitis and expansion of the cortical bone (Figure 16-1). At least three rib fragments also show periosteal reactions. Both femora display periosteal striations and pitting along the diaphysis. These pathological lesions are indicative of a generalized infection.

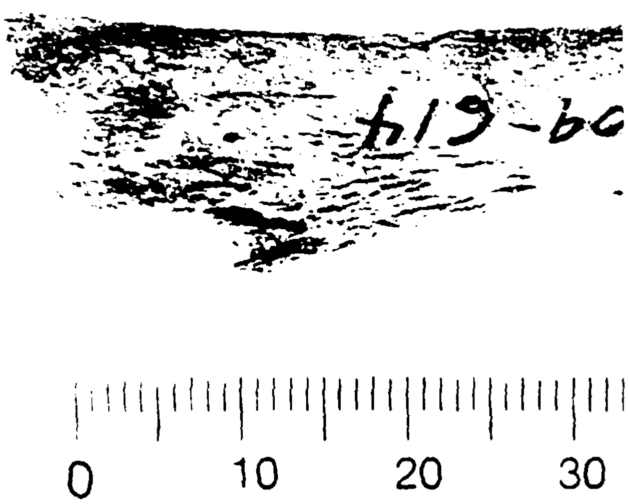

Figure 16-1. Right humerus of Burial 1 showing active periostis and proliferation of the cortical bone (scale in cm)

Burial 2. (Figure 10-2) This child of unknown age consists entirely of 19 cranial fragments which were found in association with an eagle skeleton. The general disturbance of this area by stripping and the proximity to Burial 1 suggests that these cranial fragments belong to Burial 1. The only evidence to the contrary is that both Burials 1 and 2 have an atlas (i.e., first cervical vertebrae). Despite this bone duplication, the most reasonable interpretation is that these cranial fragments belong with Burial 1 and they will henceforth be referred to as Burial 1.

Figure 16-2. Right lateral view of the skull of Burial 3, which displays anterior prognathism and an overbite

Burial 3. (Figure 10-3) This female, 4[illegible] to 49 years of age, was interred as a primary single burial in an extended supine position. Although in good condition this burial was bisected between the proximal humerii and tibiae by Historic Burial 42. The excavated skeletal remains are: cranium; mandible; scapulae; clavicles; cervical vertebrae; tibiae; fibulae; and feet. Excavation of the Historic Burial 42 grave shaft fill produced the following skeletal components: ribs; vertebrae; right hand, ulna, and radius; proximal right tibia; and left femur.

Figure 16-3. Frontal view of the skull of Burial 3, which shows the facial asymmetry and abscessed right canine (arrow)

Figure 16-4. Occlusal view of the mandible of Burial 3, showing the frequent occlusal caries, the almost complete destruction of the left third molar (arrow), and the antemortem loss of three other molars (scale in cm)

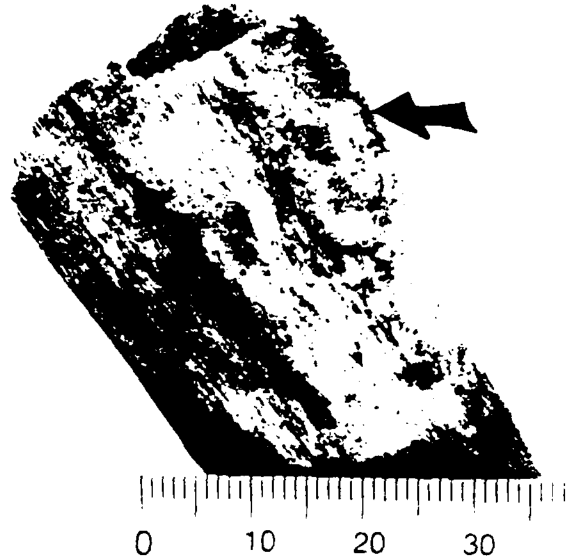

Figure 16-6. Lateral view of the left tibia of Burial 3 showing the ossified subperiosteal hemorrhage (arrow) which terminates in a postmortem break (scale in cm)

The cranium exhibits minor healed porotic pitting of the parietals and occipital. The cranium does not show any cranial deformation, while the face displays a severe asymmetry, anterior prognathism and malocclusion (i.e., overbite) (Figures 16-2 and 16-3). The malocclusion was the contributing factor to extensive interproximal caries of the maxillary incisors and canines as well as the complete destruction and abscessing of the right canine. The first two left maxillary molars display cervical caries, while the left maxillary second molar has a pit and fissure carie. The mandibular molars all have either occlusal caries or have been destroved and lost premortem by carious activity (Figure 16-4). The poor dental health of Burial 3 can be attributed to the presence of the overbite and malocclusion.

The first three cervical vertebrae exhibit breakdown at the articular surfaces and osteophytosis. All twelve thoracic vertebrae exhibit osteoarthritis of the articular facets and costal pits (Figure 16-5). The left tibia exhibits a vermiform ossified subperiosteal hemorrhage along the posterior aspect of the midshaft (Figure 16-6). One sesamoid bone is associated with the right hand, one with the right foot, and two with the left foot. The second phalange of the big toe shows extensive arthritic destruction of the distal joint probably due to trauma.

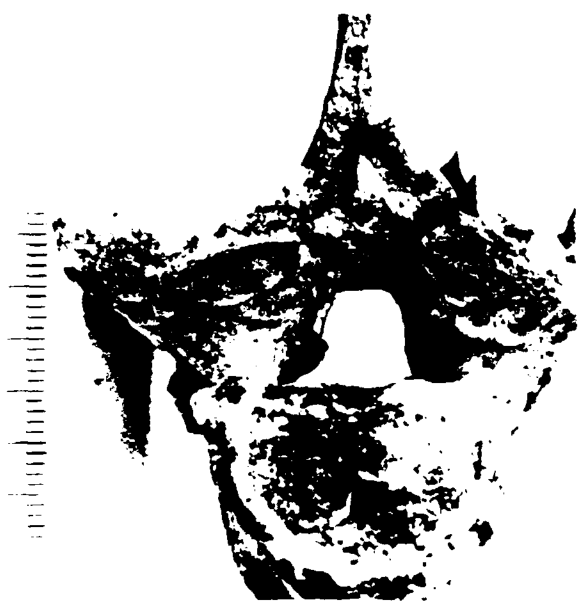

Figure 16-5. Interior view of the third throracic vertebra of Burial 3 showing the extensive osteoarthritis of the articular facets (arrow) (scale in cm)

Burial 4. (Figure 10-4) This female, 20 to 24 years of age, was interred as a primary single burial in an extended supine position. This burial is excellently preserved and represented by a complete cranial and postcranial skeleton except the left foot which was removed by Historic Burial 39. The right arm was displaced but not damaged by Historic Burial 40.

The cranium displays active porotic pitting of the parietals and occipital indicating a mild iron deficiency anemia. The maxillary dentition shows mild attrition, occlusal caries on all molars, and evidence of an anterior overbite. The mandibular molars also have numerous occlusal caries and slight attrition. A supernumerary unerupted premolar is located just inferior to the left second premolar (Figure 16-7).

The vertebral bodies exhibit a series of smooth shallow lytic lesions on the superior surfaces of thoracic 11 and 12, lumbar 5 and on the inferior surfaces of thoracic 10 and 11 (Figure 16-8). These lesions are not pathological in nature, but could represent the early stages of a progressive condition. Both clavicles show the incipient development of

Figure 16-7. Occlusal view of mandible from Burial 4, which shows numerous occlusal caries and an unerupted supernumery premolar (arrow) (scale in cm)

Figure 16-8. Anterior view of the eleventh thoracic vertebra of Burial 4 showing smooth walled lytic lesion (arrow) (scale in cm)

a rhomboid fossa (nonpathological) on the inferior surface of the distal end of the diaphysis.

The superior one-quarter of the left humerus, tibiae, and femora show pitting and striations indicative of a healed periosteal reaction attributable to a juvenile infection. Both femora have active destructive periosteal reactions on the posterior surface of the diaphysis just superior to the medial epicondyle (Figure 16-9). The

Figure 16-9. Posterior view of the distal left femur of Burial 4 showing destructive periosteal lesion at the insertion point for the gastrocnemias muscle (arrow) (scale in cm)

gastrocnemius muscle inserts at this point. Two sesamoid bones are associated with the left hand and two with the right foot.

Burial 5. (Figure 10-5) This male, 35 to 39 years, was interred as a primary single burial in an extended supine position. With the exception of the skull above the left mandible (which was destroyed by Historic Burial 61), the remainder of the skeleton is complete and in excellent condition. The mandibular dentition shows little attrition, severe crowding of the incisors and canines, occlusal caries on the second molars, and complete destruction of the third molars by carious activity. The left glenoid cavity has a small aseptic necrosis in the center of the articular surface which may be the initial stage of joint degeneration (Figure 16-10). The twelfth thoracic vertebra has an enlarged (osteoarthritic degeneration) costal pit on the left side (Figure 16-11) which is attributed to trauma because a left rib fragment also shows healed fracture. Both femora have a small destructive lesion located just superior to the posterior margin of the medial epicondyle at the insertion of the gastrocnemius muscle. The left lesion conforms to the classic description of an osteoid osteoma (i.e., benign tumor) while the right lacks the central nodule (i.e., nidus), which is frequently missing in archeological specimens (Figure 16-12). The second phalange of the left third toe has a healed fracture. Four sesamoid bones were recovered during flotation, one of which is associated with the right foot, two with the left, and one unknown.

Burial 6. (Figure 10-6) This eight year old child was interred as a primary single burial in an extended supine position. The skeleton is in an excellent state of preservation and is complete from the skull to the lumbar vertebrae, where it was truncated by Historic Burial 66. Hand bones, left pelvic fragments, and the right tibia were recovered from the grave shaft fill of Historic Burial 66. No pathologies were observed. A circular depression located at the occipital protuberance was noted. This trait is reported from southern Arkansas and northern Louisiana

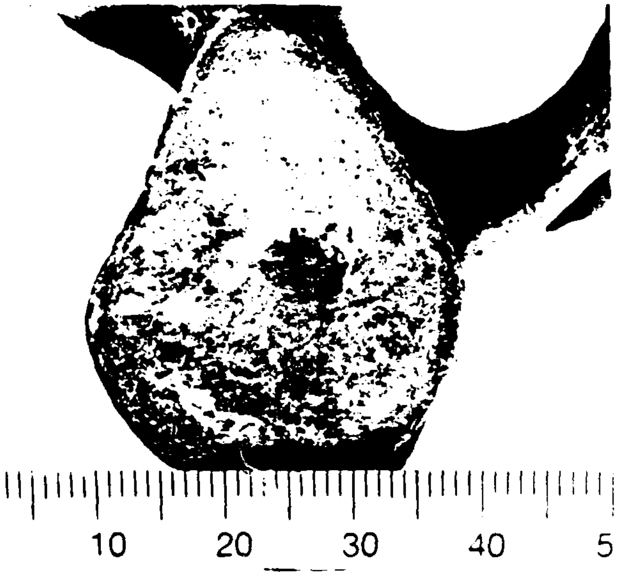

Figure 16-10. Lateral view of the left glenoid articular surface of Burial 5 showing a small aseptic necrosis (arrow) (scale in cm)

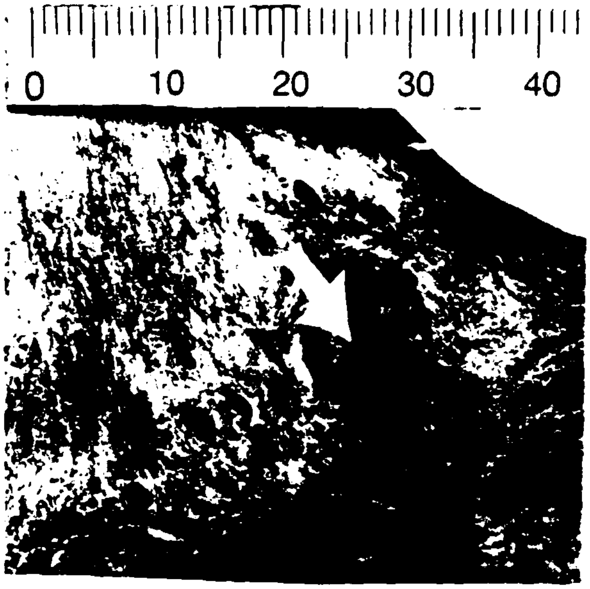

Figure 16-12. Posterior view of the distal left femur from Burial 5 showing ostoid osteoma with central nidus (arrow) (scale in cm)

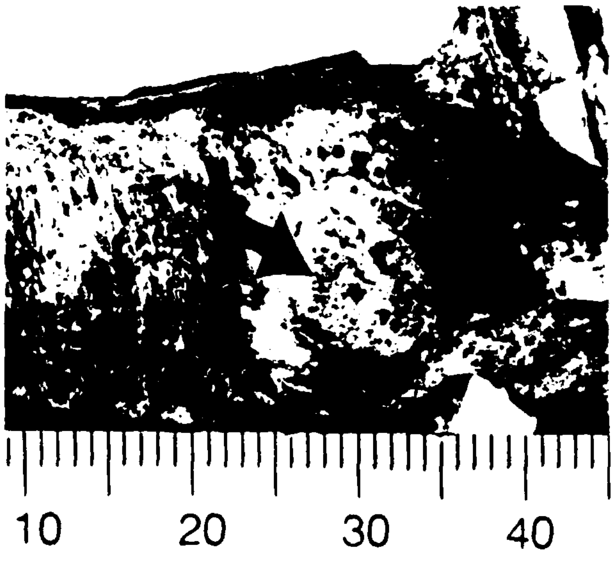

Figure 16-11. Lateral view of the twelfth thoracic vertebra from Burial 5 showing osteoarthritic degeneration of the costal pit (arrow) (scale in cm)

Figure 16-13. Left lateral view of the skull from Burial 7 showing cranial deformation

Figure 16-14. Frontal view of skull from Burial 7

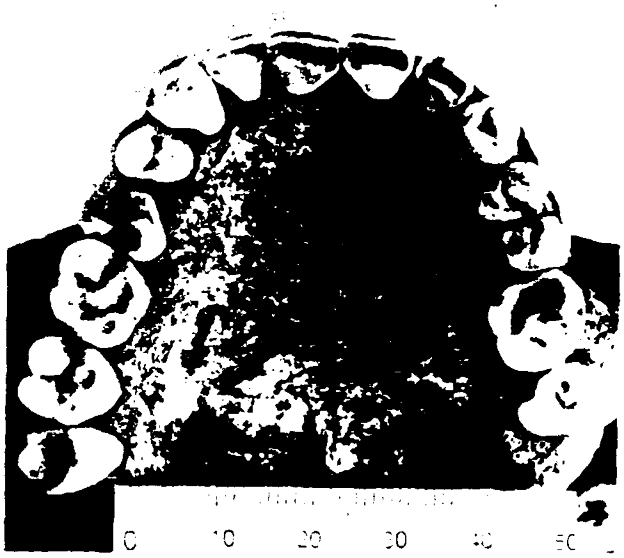

Figure 16-16. Occlusal view of maxillary *dentition* from Burial 8 showing rotation and developmental defect of the right second premolar (arrow), as well as the absence (agenesis) of the *left* second *molar* (scale in cm)

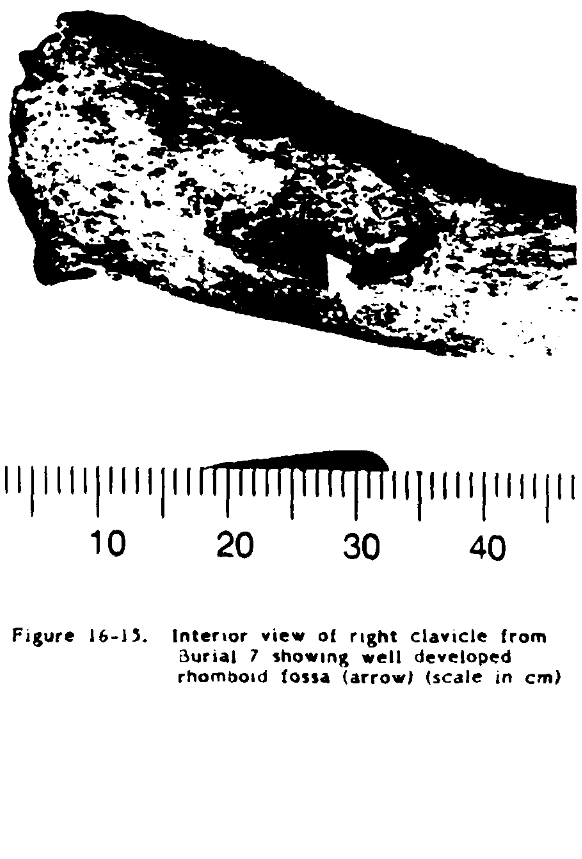

Figure 16-15. Interior view of right clavicle from Burial 7 showing well developed rhomboid fossa (arrow) (scale *in cm*)

by Hrdlicka (1909) and subsequently among prehistoric Caddo groups from Arkansas and Oklahoma (University of Arkansas collections). The existence of this feature in a young child argues for a genetic origin rather than the result of muscle development (Rose et al. 1981).

Burial 7. (Figure 10-7) This male, 20 to 24 years of age, was interred as a primary single burial in an extended supine position. This individual is in an excellent state of preservation and represented by a complete cranial and postcranial skeleton. The parietals and occipital exhibit minor porotic pitting. The cranium is artificially deformed and resembles the parallelo-fronto-occipital type established by Newman (1941) (Figure 16-13). In contrast to previous burials the face is symmetrical and the right maxillary molars all have occlusal caries as well as do the left second molars (Figure 16-14). All second and third mandibular molars have occlusal caries. The right clavicle has a well developed rhomboid fossa on the interior surface of the medial end (Figure 16-15). The right scapula shows a small aseptic necrosis in the middle of the glenoid cavity. Both femora have an erosive periosteal reaction just superior to the posterior margin of the medial epicondyle.

Burial 8. (Figure 10-8) This male, 35 to 39 years of age, was interred as a primary single burial in an extended supine position. This individual is in an excellent state of preservation and represented by a complete cranial and postcranial skeleton. The maxillary dentition shows moderate attrition and occlusal caries on all molars. Although exhibiting normal occlusion, the right maxillary second premolar is rotated 45° and has a large fracture or developmental defect along the distal border (Figure 16-16). The left maxillary second molar is developmentally absent (agenesis). The mandibular molars are also subjected to occlusal caries. The left mandibular second molar never developed (agenesis), while the right second molar is abnormally underdeveloped (i.e., only four cusps and smaller than both the first and third molars) (Figure 16-17).

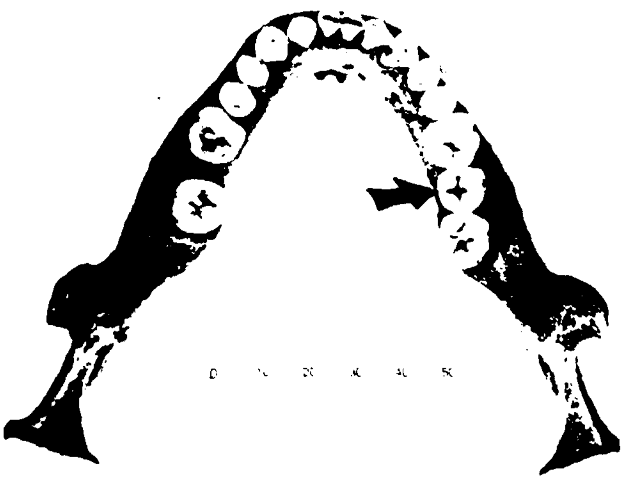

Figure 16-17. Occlusal view of mandible from Burial 8 showing agenesis of the left second molar and underdevelopment of the right second molar (arrow) (scale in cm)

The glenoid cavity of the left scapula shows the initial stages of osteoarthritic lipping and degeneration of the articular surface. The metacarpal of the fifth digit of the right hand shows a healed fracture, while the metatarsal of the fifth toe of the right foot shows sclerotic thickening and periostitis. The right costal pit of the tenth thoracic vertebra is distorted by osteoarthritis and is associated with a rib which has a healed fracture just anterior to the tubercle. The fourth thoracic vertebra has a healed fracture of the spinous process.

The eighth, tenth, and eleventh thoracic vertebrae have smooth shallow lytic depressions on the inferior surface of the body, while the twelfth vertebra has a similar depression on the superior surface. The eleventh and twelfth thoracic vertebrae have both osteoarthritis of the articular facets and osteophytosis of the body margins.

Both tibiae are thickened and the surface texture is characteristic of generalized healed periostitis (Figure 16-18). Both fibulae also display patches of healed periostitis along the shaft. Radiographic observation indicates the presence of a diffuse homogeneous increase in bone density of the humeri, vertebrae, and tibiae. Both the dry bone and radiographs are consistent with a clinical diagnosis of myelofibrosis, which is characterized by a slowly progressive splenomegaly with a diffuse metaplasia, characteristically found in middle aged individuals (Anderson and Scotti 1972).

Burial 9. (Figure 10-9) This male, in excess of 50 years of age, was interred as a primary single burial in an extended supine position. Although many bones were fragmented, this individual is represented by a complete cranial and postcranial skeleton. The parietals and occipital bones show minor porotic pitting. The left inferior nasal concha displays sclerotic thickening while the left maxillary sinus contains a bony-fibrous deposit. Eight of the maxillary teeth were lost premortem, five of these as a result of abscessing (Figure 16-19). Dental attrition is severe and resulted in exposure of the pulp and subsequent abscessing. The mandibular right first and left third molars have been lost premortem. This premortem loss can be attributed to either pulp exposure by attrition or carious activity.

The following joints all show evidence of progressive osteoarthritis: glenoid cavity of left scapula; right humerus head; trochlea and capitulum of both humerii; heads of both radii; olecranon process of the right ulna; metacarpals and phalange of the left thumb; and metatarsals and phalanges of both big toes. The right inferior articular surface of the axis has extensive arthritic degeneration. All lumbar

Figure 16-18. Anterior view of both tibiae from Burial 8 showing the generalized thickening and rough periosteal surface (scale in cm)

vertebrae show both osteoarthritis and osteophytosis. Two lumbar vertebrae have collapsed and both show evidence of lytic depressions on the superior surfaces of the bodies. Squatting facets are found on the medial condyl of the left femur and lateral condyl of the right femur.

Both tibiae are swollen with evidence of healed periostitis, also found on the right fibula. There is a thin ridge of trabeculated bone (2 cm long) located along the lateral edge of the distal one quarter of the right tibia shaft (Figure 16-20). There is a large bony process (3.0 x 1.5 x 1.5 cm) located at the attachment of the soleus muscle on the left tibia (Figure 16-21). Both of these bony projections could be either developmental (i.e., functionally produced) or possibly benign osteochondromas.

Burial 10. (Figures 10-10 and 10-11) This 12 to 15 year old juvenile of unknown sex was interred as a primary single burial in an extended supine position. This burial is in an excellent state of preservation and is represented by a complete cranial and postcranial skeleton. Despite the young age all molars have occlusal caries. The sagittal suture is completely fused indicating a possible scaphocephalic condition, which cannot be verified because of the distorted (postmortem) and fragmented nature of the cranium. The inferior-medial surface of the left clavicle has a well defined rhomboid fossa. Both femora have a destructive lesion just superior to the posterior aspect of the medial epicondyle (insertion site of the gastrocnemius muscle).

Burial 11. (Figure 10-12) This female, 46 to 50 years of age, was interred as a primary single burial in an extended supine position. This burial was truncated through the pelvis and legs by Historic Burial 9. It was further disturbed when a backhoe removed Historic Burial 9 for reburial during the summer of 1980. It was also crushed by the heavy machinery used during the stripping of the site.

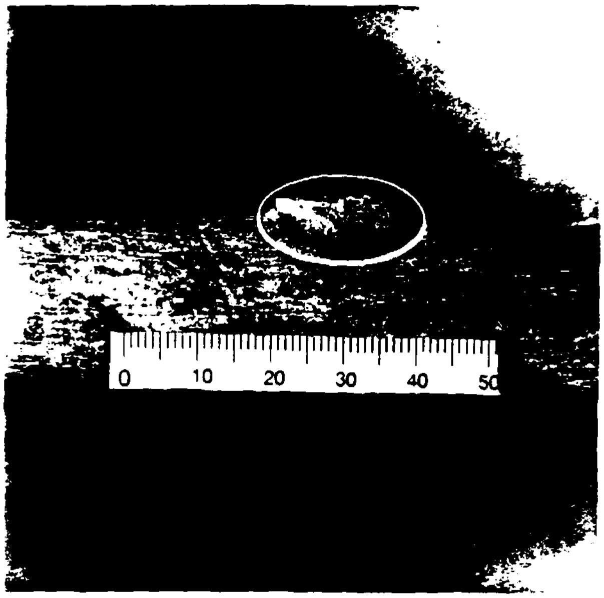

Figure 16-20. Lateral view of right tibia from Burial 9 showing ridge of trabeculated bone (circle) (scale in cm)

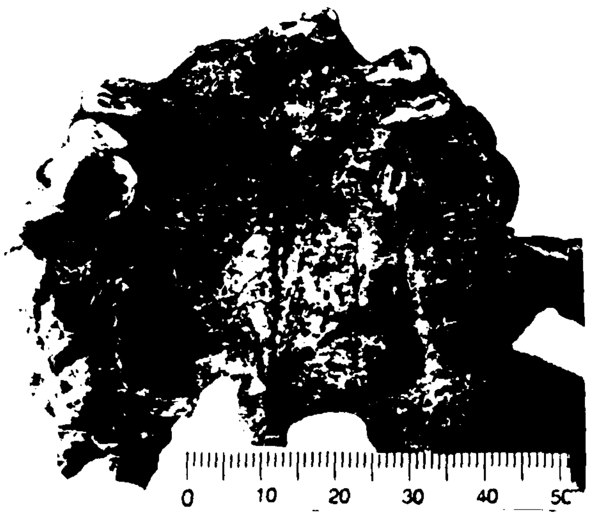

Figure 16-19. Occlusal view of maxillary dentition from Burial 9 showing premortem tooth loss, extensive carious destruction, and exposure of the pulp chamber by attrition (arrow) (scale in cm)

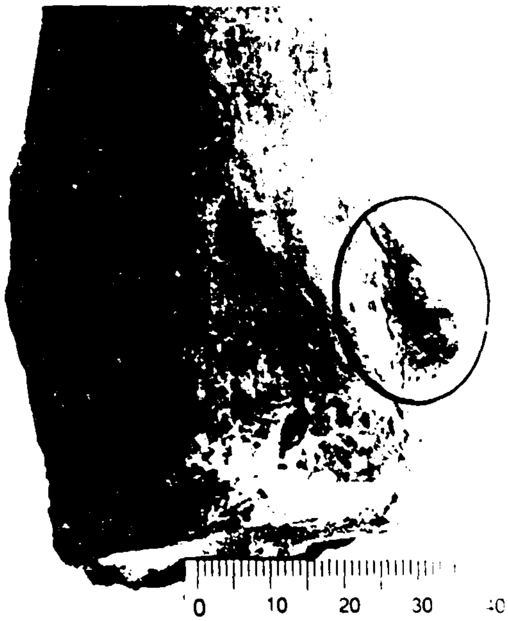

Figure 16-21. Lateral view of left tibia from Burial 9 showing large bone process on the posterior aspect (circle) (scale in cm)

Figure 16-22. Posterior view of the cranium from Burial 12 showing symmetrical depressions of the parietals (arrow)

Figure 16-23. Occlusal view of the mandible from Burial 12 showing agenesis of the left central incisor and developmental defect of the right second premolar (arrow) (scale in cm)

Most of the skull is present but highly fragmented. The postcranial skeleton is adequately represented between the cervical vertebrae and pelvis. Fragments of the left tibia were recovered from the grave shaft fill of Historic Burial 9. The teeth of both the mandible and maxilla are extensively worn and a total of four abscesses resulted from exposure of the pulp by attrition. All thoracic vertebrae display extensive osteoarthritis of the articular facets which would have severely limited spinal mobility. One right metacarpal has a healed fracture and osteoarthritis.

Burial 12. (Figure 10-13) This male, 30 to 34 years of age, was interred as a primary single burial in an extended supine position. This burial is in excellent state of preservation, but was truncated just below the pelvis by Historical Burial 77. The parietal and occipital display moderate porotic pitting. There are two symmetrical depressions (2.5 x 5.0 cm) in the parietals just anterior to the lambdoidal suture (Figure 16-22). The anomalies result from depression and modifications of the outer table and trabeculae, and do not involve the inner table with the exception of a small (1.0 x 0.5 cm) erosion through the inner table within the right depression. The maxillary first molars are absent premortem to carious activity, while the second molars both have caries and the maxillary incisors all have interproximal caries. The third molars are developmentally absent (agenesis). The first molars of the mandible are also destroyed by carious activity, while the remaining molars all have caries. The left central mandibular incisor is congenitally absent (agenesis), while the right second premolar is missing the mesial portion of the crown (developmental disturbance) (Figure 16-23).

Both ulnae have minor arthritic lipping of the proximal anterior joint surface. The first thoracic vertebrae has a healed fracture of the spinous process and arthritic degeneration of the left superior articular process.

Burial 13. (Figure 10-14) This nine month old infant was interred within a house floor (Caddo Structure 1) as a primary single burial in an extended supine position. The burial is poorly preserved and represented by: fragments of the occipital and mandible; two deciduous tooth buds; vertebrae and rib fragments; left pelvis; and fragments of all long bones. Active proliferative periostitis is found on the diaphyses of the right femur, both tibiae, and both fibulae. This is indicative of active generalized infection.

Burial 14. (Figure 10-15) This male, 35 to 39 years of age, was interred as a primary single burial in an extended supine position. This burial is in an excellent state of preservation with the exception of the distal three quarters of the left tibia and foot which were destroyed by Historic Burial 23. The cranium displays minor pitting of the parietals and occipital, as well as a depressed occipital protuberance. Both maxillary second premolars have been destroyed by caries. The right first molar has an interproximal carie. The mandibular right second molar and left second premolar have been lost premortem, while the right second and third molar have been almost destroyed by caries.

The right clavicle has a moderately developed rhomboid fossa on the anterior medial surface. Thoracic vertebrae 11 and 12 show osteoarthritic deformation of the costal pits of the body which correspond to a proliferative condition on the ribs. The right ulna has a healed fracture of the distal one quarter of the diaphysis (Figure 16-24). The right femur has a slight trabeculated porosity located just superior to the posterior-medial epicondyle which might represent the initial stages of the condition observed in the other burials. Both tibiae have lateral squatting facets. The right hand has three sesamoid bones, while the left has two. Two sesamoid bones were recovered by flotation from the foot area.

Figure 16-24. Lateral view of the right ulna from Burial 14 showing healed fracture (arrow) (scale in cm)

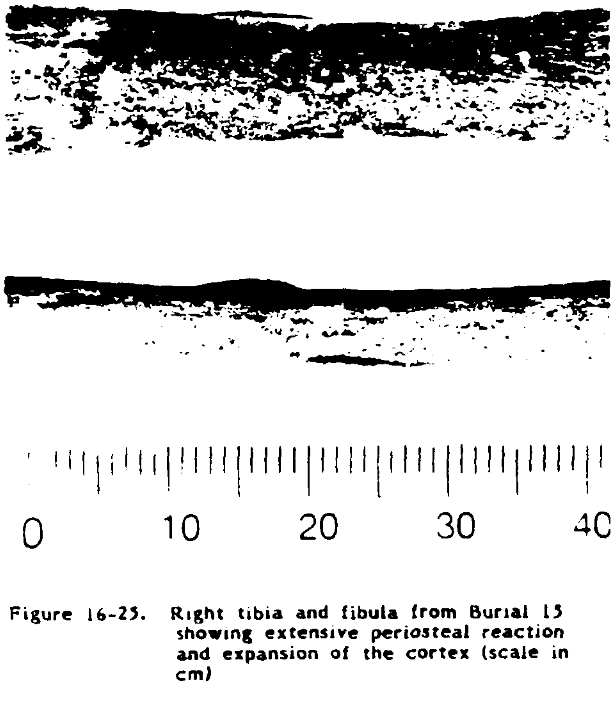

Figure 16-25. Right tibia and fibula from Burial 15 showing extensive periosteal reaction and expansion of the cortex (scale in cm)

Burial 15. (Figure 10-16) This six year old child was interred as a single primary burial within a house structure in a semiflexed position on its left side. The burial is in poor condition with a fairly complete but fragmented cranial and postcranial skeleton. The feet are missing due to disturbance by a bulldozer trench. Both left deciduous molars have occlusal caries. One thoracic vertebra shows complete degeneration of the body, while another has large circular lesions. The right tibia and fibula show periosteal reactions (Figure 16-25) indicative of generalized infection.

HUMAN BONE RECOVERED FROM NONBURIAL AREAS

80-1209-34; S42 E181; midden; vicinity of Burials 3 and 14; distal one-third of left tibia

80-1209-362; S54-92 E179.45; extension of Backhoe Trench 2; mandibular second deciduous molar with large carie.

80-1209-195; E175 S65; column sample, 0-10 cm, between Burials 3 and 4; transverse process of vertebra

80-1209-433; midden; east of Burial 1; unfused femur epiphysis

80-1209-438; east muck ditch south of Backhoe Trench 1; south and east of Burial 1 unfused ilium, possibly from fetus or neonate.

80-1209-446; west muck ditch, west of Levee Transect Units 7 and 8, south and east of burial; adult metacarpal petrous portion of the temporal bone

80-1209-537; general midden, west of levee; proximal one-half of immature left tibia; diaphysial fragment of mature humerus

80-1209-746; midden, Levee Transect Unit 10, between burial groups A and C; human femur, water worn and partially fossilized

None of the above human bones belong to any of the excavated prehistoric burials. It is common to find human bones scattered across prehistoric sites and no significance can be attributed to these finds. The waterworn femur (80-1209-746) indicates that some of the material could have been deposited by flood water.

SEXUAL DIMORPHISM

The small sample size of the Cedar Grove skeletal series makes analysis of sexual dimorphism difficult and all conclusions must be tentative. All morphological characteristics (i.e., linea aspera, mastoid process, sciatic notch, etc.) are comparable to similar series of Caddo skeletons from Arkansas and Oklahoma housed at the University of Arkansas. One notable feature is the well developed female external occipital protuberance. Well developed female occipital protuberances (i.e., within or exceeding the male range) have been reported by both Hrdlicka (1909) and Rose (Rose et al. 1981 and Rose 1981) for skeletons from eastern Oklahoma, southern Arkansas, northern Louisiana, and Mississippi. This feature appears to be commonly found in non-Mississippian (cultural designation) skeletal series throughout the Trans-Mississippi South. We have been working on this trait for four years now with both physical anthropologists and anatomists. The action of most of the muscles involved in the hyperdevelopment of the occipital proturberance do not seem to be used with a tump line. However, research is continuing.

Although metric analysis is hampered by the small number of females (3) from Cedar Grove, the often incomplete skeletons, and the paucity of comparative data, some conclusions can be drawn. Table 16-1 lists the means for males and females of two frequently found measurements (i.e., femur shaft circumference and femur head diameter) obtained from seven skeletal series. The McCutchan-McLaughlin site represents the Fourche Maline of Oklahoma and 22LO530-22IT537 represents the Late Woodland of Mississippi. The Cooper Lake group represents Caddo I and II, while Kaufman-Williams, Kaufman, and Roden represent Caddo IV sites. (Table 16-2 indicates the references for these and other sites discussed in this chapter.) Examination of these means reveals that both males and females from the Woodland and Fourche Maline

Table 16-1. Measures of sexual dimorphism of sexed individuals using the femur midshaft circumference and femur head diameter

Period	Site	Femur Midshaft Circumference						Femur Head Diameter			
		Males			Females			Males		Females	
		N	M	S.D.	N	M	S.D.	M	S.D.	M	S.D.
Late Woodland	22LO530,22IT537	10	8.38	0.33	6	7.55	0.39	4.42	0.20	3.85	0.15
Fourche Maline	McCutchan-McLaughlin	9	8.30	0.70	8	7.50	0.50				
Caddo I and II	Cooper Lake	7			6			4.65		4.16	
Caddo IV	Kaufman-Williams	23	8.78	0.57	24	7.89	0.57	4.56	0.24	4.05	0.19
Caddo IV	Kaufman	6			8			4.59		4.06	
Caddo IV	Roden	6			9			4.60	0.20	4.2[illegible]	0.14
Caddo V	Cedar Grove	5	9.04	0.23	2	7.80		4.64	0.11	4.10	0.14

Table 16-2. Alphabetical list of archeological sites with associated burials used in the Cedar Grove bioarcheological comparative analysis

Belcher Mound	A large Caddo II site in Caddo Parish La. (Webb 1944; 1959)
Bentsen-Clark	A Caddo II site along the Red River in Texas (Buikstra and Fowler 1975)
Cooper Lake	A group of five sites from eastern Texas assigned to Caddo I/II period (Hyatt and Doehner 1975)
Copeland Ridge	A Caddo IV site (3CL195) in Ouachita region of Arkansas (unpublished data, University of Arkansas; Powell and Rogers 1980)
Crenshaw	Large ceremonial center that produced eight Caddo I skulls (Powell 1977)
Ferguson	A mound site in southwest Arkansas that produced both Fourche Maline and Caddo I burials (unpublished data, University of Arkansas)
Gahagan Mound	A small Caddo I component site located in Red River Parish LA (Colquitt and Webb 1940)
Hazel	A large Mississippian site in northeast Arkansas (3PO6) (unpublished data, University of Arkansas)
Hedges	A Caddo IV site (3HS60) in the Ouachita region of Arkansas (Unpublished data, University of Arkansas; Powell and Rogers 1980)
Horton	A Caddo II site in Oklahoma (Brues 1958)
(Sam) Kaufman	A large Caddo site along the Red River in Texas. Burials have been treated as Caddo IV but they may be earlier. The other half of site is known as Kaufman-Williams (Butler 1969)
Kaufman-Williams	A Caddo IV site along the Red River in Texas, The other half of (Sam) Kaufman
Libben	A large Late Woodland cemetery in Ohio. (Boyd 1978; Rose 1981; Rose and Boyd 1978; Mensforth et al. 1978)
McCutchan-McLaughlin	A Fourche Maline site from eastern Oklahoma (Powell and Rogers 1980)
Mahaffey	A Fourche Maline site in easter Oklahoma (Perino and Bennett 1978; unpublished data, University of Arkansas)
Morris	A Caddo II site in Oklahoma (Brues 1959)
Nagle	A Caddo II site in Oklahoma (Brues 1957)
Roden	A large Caddo site with skeletal material from both Caddo II and IV in eastern Oklahoma. This site is contemporaneous and shows close contact with Sam Kaufman and Kaufman-Williams site (Perino 1981; Rose et al. 1981; unpublished data, University of Arkansas)
Sam and Wann	Two Fourche Maline sites in eastern Oklahoma (McWilliams 1970)
Standridge	A small Caddo III mound site (3MN53) in the Ouachita region of Arkansas (unpublished data, University of Arkansas)
22Lo530, 22It537	Two Late Woodland sites from Mississippi (Rose 1981)

sites are consistently smaller than their Caddo counterparts. Despite the small sample sizes, this consistent pattern of increased robustness in both males and females suggests an improvement in the total growth environment (i.e., diet, disease, etc.) for Caddoan peoples. Thus, changes in both diet and disease patterns could have resulted from the transition from Fourche Maline to Caddoan cultural adaptations.

DEMOGRAPHY

Demographic analysis is the ideal method for the evaluation of the adaptive efficiency of any population (see Swedlund and Armelagos 1976). Although the demographic literature contains many critical and cautionary statements concerning the application of demographic analysis to prehistoric skeletal series (Howell 1973; Weiss 1972), it has been conclusively demonstrated that paleodemography can be a very productive technique (Lallo et al. 1980; Lovejoy et al. 1977; Weiss 1973). Prior to analyzing the demographic data or for that matter making any other comparisons such as paleopathology, the representativeness of the skeletal series must be established. If the skeletal series is not a realistic sample of a biological population, then the observations obtained from the series cannot be generalized to the entire population of the archeological community.

Examination of the age and sex distribution of the Cedar Grove skeletal series reveals that it is not a typical population distribution, i.e., from model life tables (Weiss 1973). Specifically there are too few children and adult females (Table 16-3). Although the distribution is not biologically normal (defined from living populations), it is typical of Caddoan skeletal series in general. The mean of the percentages of children dying prior to five years of age from 18 Caddoan sites is 9.8% with a range between 37.5

Table 16-3. Demography of the Cedar Grove skeletal series

	Age										
	0-1	2-5	6-10	11-15	16-19	20-24	30-34	35-39	40-44	45-49	50+	Total
Males						1	1	3			1	6
Females						1				2		3
Unknown	2		2	1								5
Total	2		2	1		2	1	3		2	1	14

Table 16-4. Proportional demography by age and sex for 21 Fourche Maline and Caddo sites

Sites	Number of Burials	Individuals five years or younger		Females Dying Prior to 35		Males Dying Prior to 35		Male/Female Ratio
		%	N	%	N	%	N	
Fourche Maline								
McCutchan-McLaughlin	47	17.0	(8)	56.2	(9)	54.5	(6)	0.69
Sam and Wann	103	9.7	(10)	52.4	(22)	28.6	(10)	0.83
Ferguson	9	0.0	(0)					
Caddo I								
Gahagan Mound	10	10.0	(1)					
Crenshaw	8	0.0	(0)					
Cooper Lake	22	0.0	(0)	85.7	(6)	88.9	(8)	0.83
Caddo II								
Belcher Mound	10	10.0	(1)	16.7	(1)	00.0	(0)	0.17
Roden	17	5.9	(1)	42.8	(3)	25.0	(1)	0.57
Bentsen-Clark	32	0.0						1.0+
Horton	33	9.1	(3)	00.0	(0)	0.0	(0)	1.83
Nagle	16	37.5	(6)	100.0	(1)	75.0	(3)	4.00
Morris	72	19.4	(14)	25.0	(4)	19.0	(4)	1.31
Ferguson	9	0.0		33.3	(1)	0.0	(0)	1.00
Caddo III								
Standridge	3	0.0	(0)	100.0	(2)	0.0	(0)	0.50
Caddo IV								
Roden	26	30.8	(8)	50.0	(2)	50.0	(4)	2.00
Kaufman-Williams	75	13.3	(10)	48.1	(13)	74.1	(20)	1.00
Sam Kaufman	23	0.0	(0)	16.7	(2)	14.3	(1)	0.58
Hedges	22	0.0	(0)	0.0	(0)	37.5	(3)	4.00
Copeland Ridge	19	0.0	(0)	75.0	(3)	16.7	(1)	1.50
Belcher Mound	36	30.6	(11)	54.5	(6)	60.0	(3)	0.60
Cedar Grove	14	14.3	(2)	33.3	(1)	33.3	(2)	2.00

and 0 % (Table 16-4). Thus the proportion of Cedar Grove children dying prior to five years (14.3%) is typical of Caddo sites. The male-female ratio of 2.00 is also typical of the Caddo, where 11 out of 17 sites have more males and females. This disparity between the age and sex distribution of Caddoan skeletal series and the ideal population profile can be explained by a combination of small sample size, excavation strategy, and differential burial practices.

Although Caddoan burial practices have changed through time, the entire period is characterized by both mound and habitation site burial locations. If mound burial implies high achieved or ascribed status in a patrilineal society, then more males than females and few infants should be found in the mounds, while more females and subadults should be found in the habitation areas. A rigorous test of this hypothesis is crucial to understanding both Caddo demography and social organization, but beyond the scope of this report. Preliminary analysis of the skeletal series listed in Table 16-4 provided neither support nor refutation of the above hypothesis. As a consequence, there is not enough known about Caddoan burial customs to enable the peculiarities of the demographic profile found at Cedar Grove and other Caddoan sites to be explained. Cedar Grove is clearly a habitation burial area, where children were interred within the house structures while juveniles and adults are deposited nearby. The postulated settlement pattern for Caddo IV and V within the Great Bend area is one of farmsteads, each with dwelling and storage structures, distributed along the Red River (Chapter 2). Thus, the dead of each family should be interred within the farmstead. The next question that must be considered is whether or not the Cedar Grove series could represent the dead of a single family or series of families occupying the excavated farmstead.

Before the skeletal series can be accepted as representative, the predominance of males and the low frequency of infants must be explained. Eight (89%) of the nine excavated adult skeletons were located by systematic probing, because the grave fill could not be distinguished from the natural soil within the stripped area. Only two (40%) of the five subadults were located with a probe, while the remaining three were located during shovel excavation. It is unlikely that the children with their lighter bone density, poorer preservation, and less extensive (in both size and number) ceramic grave goods could have been located with a probe. In fact, the two subadults located with a probe were larger (8, and 12 to 15 years of age) and better preserved than the other three. Thus it is highly possible that additional infants and children were buried at the Cedar Grove site and remained undiscovered. Another alternative is that the children's graves were all shallow and were consequently destroyed by the stripping activity. It should be mentioned that even at extensively

excavated sites, producing large skeletal series (i.e., McCutchan-McLaughlin, Sam and Wann, Horton, Morris, Kaufman-Williams, and Roden), the proportion of infants is below the expected 30 to 60 percent.

The surplus of males can best be explained by the random nature of mortality within a small family group. The Cedar Grove burials have been divided into five distinct groups (Chapter 10), each representing a subsample of the total mortality experience within the Cedar Grove area. Group A was in the indirect impact zone. This unit contains two children (Burials 13 and 15) interred within a habitation structure (Structure 1). Systematic probing of the surrounding area did not produce any adult graves. Group A can be considered representative of the deaths expected within a family occupying the house for a short period of time. Group B contains one infant (Burials 1 and 2 are a single individual) associated with a possible house floor (Structure 2) and can be considered representative of another short occupation by a family. Group C contains seven individuals (Burials 3, 4, 5, 6, 7, 9, and 10) which were grouped on the basis of proximity, grave orientation, and ceramic grave goods. The mortality distribution of two subadults, two females, and three males is exactly what would be expected from a family group if it is assumed that infants were interred within house floors as suggested by units A and B. Group D (Burials 11 and 12) are considered separate because of distance and the equal sex distribution is normal. Unit E (Burials 8 and 14) is segregated from the others because of distance, grave orientation, and earlier (Caddo IV) ceramic grave goods. The small sample size is just as likely to produce two males as two females or one of each. Again this group can be considered representative of a family group.

These data suggest that the Cedar Grove skeletal series represents the mortality experience of a single family (of unknown structure) occupying the farmstead over a short period of time (i.e., 100 years). The atypical demographic profile can be attributed entirely to the small sample size and settlement pattern of the Great Bend Caddo. This contention can be supported by examining six family cemeteries from rural Arkansas used for approximately the same length of time during the later part of the nineteenth and early part of the twentieth century (Table 16-5). The proportion of individuals dying prior to five years of age ranges between 0 and 44.4 %, while the male-female ratio varies between 5.0 and 0.6. These data suggest that it is possible that the infants at Cedar Grove are not underrepresented and that the Cedar Grove demographic distribution could represent a family cemetery.

However, the interpretation of the Cedar Grove skeletal series which follows must be considered to apply only to the group occupying the Cedar Grove farmstead and not to the entire Caddo population of the Cedar Grove area. Until 20 to 30 similar skeletal series are excavated, it will not be possible to do formal demographic analysis and extrapolate the biological data to the entire local population. In addition, reconstruction of Caddo social organization and the explanation of the surplus males and missing infants at most Caddo sites must await additional excavations.

Table 16-5. Rural Arkansas family cemeteries used between 1790 and 1930 (Cemetery Records Of Washington County Historical Society, Fayetteville)

Name	Number Graves	Individual five years or younger		Male/Female Ratio
Baker	8	0.0	(0)	0.6
Beaty	6	16.7	(1)	5.0
Boone	9	44.4	(4)	0.8
Boyd	4	25.0	(1)	1.0
Brewster	14	7.1	(1)	0.8
Deen	8	25.0	(2)	0.6

Although the Cedar Grove sample is too small for demographic analysis, a preliminary examination of the published demographic data will be pertinent to the interpretation of the Cedar Grove paleopathology. Eight skeletal series from Oklahoma representing the Fourche Maline (McCutchan-McLaughlin, Sam and Wann), Caddo II (Horton, Nagle, and Morris), and Caddo IV (Roden, Kaufman-Williams, and Sam Kaufman) will be used. These data were integrated into life tables using large age categories, necessitated by the diversity of age groupings used by several osteologists. Although the determination of the adult ages varied in technique, the subadult age determinations used the same criteria and can be considered comparable. Examination of Figure 16-26 reveals that the Fourche Maline and Caddo IV samples have similar probabilities of dying until age 30, while the Caddo II sample has a higher subadult and lower adult probability of dying. Using only the more reliable subadult probabilities, these data suggest that the early Caddo were under more overall stress than the Fourche Maline and late Caddo. Cook and Buikstra (1979), using Woodland skeletal series from the Lower Illinois Valley, suggest that stress is greatest during the transition to a new economic-social structure (i.e., from hunting and gathering to agriculture). The preliminary demographic analysis presented in Figure 16-26 suggests that the early Caddo periods (I and II) might be the transitional era between the two well adapted cultural systems of the earlier Fourche Maline and later Caddo.

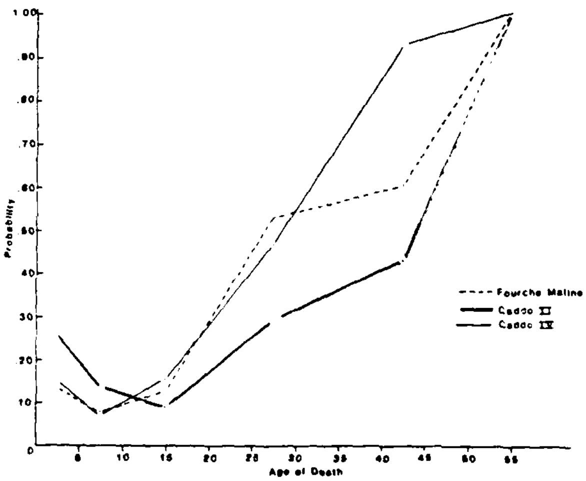

Figure 16-26. Probability of dying for the Fourche Maline, Caddo II and Caddo IV periods in Oklahoma

PALEOPATHOLOGY

Analysis of pathological lesions of the skeleton can be difficult because specific diagnosis is seldom possible. It has been demonstrated that grouping skeletal lesions into broad etiological categories (i.e., infections) can provide an excellent evaluation of the health status and, subsequently, the adaptive efficiency of prehistoric populations (Armelagos 1969; Lallo and Rose 1979). For example, the transition from hunting and gathering to maize agriculture at Dickson Mounds (in Illinois) is associated with dramatic increases in infections, degenerative diseases, and mortality (Lallo and Rose 1979). In this particular case, a change in subsistence

and social organization decreased the adaptive efficiency of the Dickson Mounds population. Cook and Buikstra (1979) suggest that adaptive efficiency is most dramatically reduced during the actual transition between two subsistence strategies or social organizations. They specifically observe an increase in pathology and stress during the terminal Late Woodland in the Lower Illinois Valley. If we assume that the Caddo culture, with its associated agriculture and complex social organization, developed from the indigenous hunting and gathering Fourche Maline, then a period of reduced adaptive efficiency should mark this transition. The demographic data, as previously mentioned, suggest that the era of reduced adaptive efficiency occurred during the early Caddo periods. This hypothesis will be tested with the paleopathology data derived from the literature.

The first pathology category to be considered is infectious disease. All the observed infections at Cedar Grove are inflammations of the periosteum (periostitis) of the long bones, particularly the tibiae, femora, and fibulae (Table 16-6). Periostitis (primarily bacterial infection) results in the deterioration of the cortical surface and eventual deposition of new bone between the elevated periosteum and the original bone surface. All the periostitis observed among the Cedar Grove adults was actively being remodeled (healing) at the time of death. In contrast, all the subadult periostitis was active at the time of death. The adult infection rate of 28.6% is fairly high, but the small sample size precludes the attachment of great significance to this rate. The subadult rate of 60.0% is also high, but not unexpected in prehistoric samples. In fact, when the sample size of Cedar Grove is considered, both the adult and subadult infection rates can be considered typical (neither high nor low) of prehistoric skeletal series from the Southeast.

Table 16-6. Percentage of (observable) pathological lesions by individual

Pathological Category	Subadults %	Subadults N	Adults %	Adults N	Total %	Total N
Porotic hyperostosis*	0.0	(0)	77.8	(7)	58.3	(7)
Periostitis	60.0	(3)	28.6	(2)	38.5	(5)
Osteophytosis			33.3	(3)		
Osteoarthritis			55.6	(5)		
Trauma	0.0	(0)	55.6	(5)	28.6	(4)

*mild

It should be pointed out, however, that the high infection rates could be consistent with increased sociocultural stress as indicated by the presence of reused mortuary ceramics and/or the possibility of disease stress caused by European diseases. Unfortunately, the highly contagious European diseases, with the exception of tuberculosis, do not produce distinctive skeletal lesions.

Comparative data were obtained by reviewing the published literature and transforming the infection data for adults into a form comparable to that used in this analysis. The three cultural-chronological periods which provided adequate data are: Fourche Maline (McCutchan-McLaughlin; Sam and Wann); Caddo II (Ferguson; Morris; Nagle; Horton; Roden; Cooper Lake); and the Caddo IV (Belcher Mound; Copeland Ridge; Hedges; Sam Kaufman; Kaufman-Williams; and Roden). Examination of Table 16-7 reveals that the Fourche Maline burial populations have a remarkably low infection rate which increases during the Caddo II period only to decline again during Caddo IV. These data support the hypothesis, derived from the demographic data, that the early Caddo experienced the lowest adaptive efficiency. This suggests that major subsistence and socioeconomic changes took place during early Caddo development.

Table 16-7. Paleopathology of the Fourche Maline, Caddo II, and Caddo IV skeletal series

Pathologies		Fourche Maline	Caddo II	Caddo IV	Cedar Grove
Infections	%	11.4	26.2	17.6	28.6
	#	13	32	26	2
	Total	114	122	148	9
Osteophytosis	%	18.4	11.6	30.5	33.3
	#	21	10	39	3
	Total	114	86	128	9
Osteoarthritis	%	10.8	7.0	8.5	55.6
	#	4	6	11	5
	Total	37	85	129	9
Porotic hyperostosis	%	24.3	15.2	10.4	77.8
	#	9	16	11	7
	Total	37	105	106	9
Trauma	%	4.4	7.4	7.0	55.6
	#	5	7	9	5
	Total	114	94	129	9

The degenerative diseases found at Cedar Grove are osteophytosis (lipping of the vertebral margins) and osteoarthritis (deterioration of the movable joint surfaces). The primary causes of these two pathological lesions are chronic physical stress and trauma, and when age adjusted, the prevalence rates for these degenerative conditions can be used to characterize the relative amount of strenuous physical activity (i.e., carrying, lifting, and pushing). The osteophytosis rate of 33.3% at Cedar Grove is not remarkably high and in fact is the same as the rate for the Caddo IV skeletal series (30.5%). Examination of the comparative data reveals an increase in osteophytosis between the Fourche Maline/Caddo II and the Caddo IV skeletal series. This increase suggests an accentuation of the physical stresses upon the vertebrae during the Caddo IV period. The previous discussion suggested a change in subsistence-social organization during the Caddo I and II periods. The reason for this increase in physical stress on the vertebrae cannot be determined from these data but could be attributed to one of several alternatives, including an increase in agricultural workload or a different pattern of obtaining wild foods. Whatever the ultimate cause for the increase in osteophytosis, the Cedar Grove rate suggests that the stress pattern continued into the Caddo V period.

The osteoarthritis rate (55.6%) at Cedar Grove is remarkably high when compared to the other skeletal series. This rate might be inflated as two of the five cases are confined to the articular facets of the vertebrae. [illegible] is highly probable that spinal osteoarthritis was not recorded as such in the comparative series. The remaining three cases are found primarily in the joints of the shoulders and arms. Two of these are in the initial stages and again might not have been recorded in the other studies. The remaining case is an old (50 years) male with extensive osteoarthritis of the shoulder, arm, and spine. If only this last individual is used in computing the osteoarthritis rate (11.1%), it is comparable to the rates from the Fourche Maline, Caddo II, and Caddo IV. It should be noted that the rate of osteoarthritis does not change over time.

Trauma as *defined in this study* includes only evidence of fractures, which show unmistakable signs of healing, and does not include projectile points embedded in the bone, which is a condition common among the Fourche Maline burial populations (Powell and Rogers 1980). As in the case of osteoarthritis, the Cedar Grove trauma rate of 55.5% is considerably higher than the comparative materials. However, four of the five individuals with healed fractures have only minor fractures of the hands, feet, and vertebral processes. These might not have been recorded for skeletal series that are not as well preserved as Cedar Grove. The remaining individual (Burial 14) has a clearly observable healed fracture of the right ulna. If the trauma rate is recalculated using only this one fracture, the resulting

11.1% rate is comparable to those from the Fourche Maline, Caddo II, and Caddo IV skeletal series. No fluctuations in the trauma rate are observed over time in the comparative material (Table 16-7).

Porotic hyperostosis (extensive pitting and expansion of the diploe in cranial bones) has recently been the subject of extensive and exhaustive research (El-Najjar et al. 1976; Lallo et al. 1977; Mensforth et al. 1978). Both El-Najjar et al. (1976) and Lallo et al. (1977) have demonstrated an etiological relationship between porotic hyperostosis and iron deficiency anemia associated with maize agriculture from both the American Southwest and Midwest. Mensforth et al. (1978) have indicated a similar relationship with childhood iron deficiency resulting from infection. The Cedar Grove adult porotic hyperostosis rate (77.8%) is much higher than the comparative material. In fact, all the cases of porotic hyperostosis (with one possible exception) are marginal and might not have been recorded by the other researchers. Examination of the burial reports indicated that only extreme cases were recorded for the comparative skeletal series. If only the one extreme case is used, the Cedar Grove rate is reduced to 11.1%. The validity of this rate is supported by the absence of both cribra orbitalia and porotic hyperostosis among the Cedar Grove subadults, which should show some evidence of the condition if the 77.8% adult rate is accurate. The modified adult rate for porotic hyperostosis at Cedar Grove is comparable to the Caddo rate of 10.4% (see Table 16-7). Table 16-7 indicates that there is a consistent, but not statistically, significant decline in the prevalence of porotic hyperostosis over time. This suggests that either consumption of maize declined over time or the diet was supplemented with high iron content foods such as meat. The last alternative has been previously suggested by Rose et al. (1981) and seems the most reasonable of the alternatives considering the extensive archeological evidence for Caddo maize agriculture (Hemmings 1982) and the high C-13/C-12 ratios at Cedar Grove indicating high maize consumption (see Chapter 17). The frequent consumption of red meat, which would ameliorate the maize-induced iron deficiency, is evidenced by the faunal analysis (see Chapter 15).

DENTAL CARIES

The analysis of dental caries has been shown to be invaluable in the reconstruction of prehistoric diets (Hardwick 1960; Moore and Corbett 1971; Turner 1979). Decay of human teeth is a complex process influenced by tooth morphology, age, physical consistency of the diet, microbiology of the mouth, and sugar/carbohydrate consumption. In order to control for most of these variables and isolate the sugar/carbohydrate component, the data must be segregated by age (at the same time dental attrition), tooth type (i.e., molars), and tooth surface (i.e., occlusal). Controlling for tooth surface is critical because the teeth pass through a life cycle of caries location. Occlusal caries are most common in the young when the pits and grooves retain plaque and decrease with age (in prehistoric populations) as the occlusal surface is worn flat. Interproximal caries (i.e., between the teeth) are more common in middle age, while cervical and root caries increase in the older age groups when periodontal (gum) disease is common.

The distribution of caries among the adults from Cedar Grove fits this patterning. The distribution of caries among the tooth types is almost typical (Table 16-8 and Figure 16-27) with the most complex teeth (i.e., molars) having the most caries, followed by the simpler incisors, premolars, and canines. When compared to two normal distributions from the Fourche Maline and Caddo (Figure 16-27), Cedar Grove has a lower than expected caries frequency for the premolars and a higher than expected frequency for the

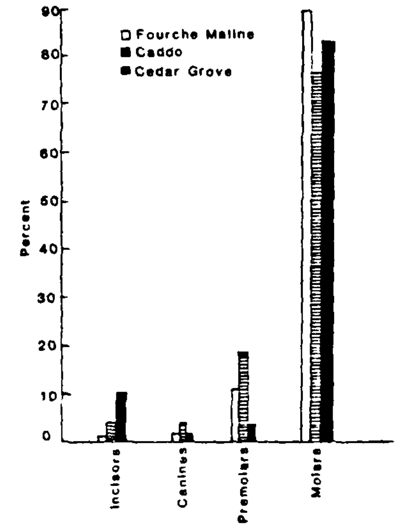

Figure 16-27. Perc... of total caries by tooth type

Table 16-8. Index of caries per tooth by tooth type and tooth surface for all Cedar Grove adults

	Occlusal	Interproximal	Cervical	Smooth Surface	Root	All Caries	Total
Molars	0.96	0.02	0.03	0.00	0.00	1.02	88
Premolars	0.05	0.02	0.00	0.00	0.00	0.06	6[illegible]
Canine	0.03	0.00	0.00	0.00	0.00	0.03	33
Incisors	0.00	0.16	0.02	0.00	0.00	0.17	63
Total	0.36	0.05	0.02	0.00	0.00	0.43	248

Table 16-. Percentage of total caries by tooth surface

Site	Occlusal	Interproximal	Cervical	Smooth Surface	Root
Sam and Wann	65.8	34.2	0.0	0.0	0.0
McCutchan-McLaughlin	43.6	48.7	5.1	2.6	0.0
Copeland Ridge-Hedges	69.0	15.9	9.7	4.7	0.7
Cedar Grove	84.0	12.3	3.8	0.0	0.0

incisors. Considering the small sample size of only nine adult dentitions, the premolar frequency is not unrealistic. The slightly higher frequency of incisal caries is produced by one individual (Burial 12) with severe malocclusion effecting the anterior dentition. The distribution of caries by tooth surface at Cedar Grove is normal (Table 16-8, Figure 16-28) with occlusal caries the most frequent followed by interproximal, cervical, smooth surface, and root caries. Examination of Table 16-9 indicates that the distribution of caries by tooth surface at Cedar Grove is comparable to the Caddo series from Copeland Ridge and Hedges, but different from the Fourche Maline series (Sam-Wann and McCutchan-McLaughlin). The Fourche Maline dentitions have a significantly higher frequency of interproximal caries. The frequency of interproximal caries increases with dental attrition, which as will be discussed below, is far more extensive among the Fourche Maline.

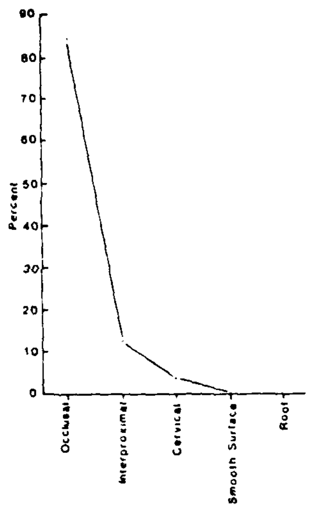

Figure 16-28. Percent of total caries by location

Table 16-10. Index of caries per tooth and individual by cultural affiliation

Cultural Affiliation	Caries/ Individual	Caries/ Tooth
Fourche Maline		
Sam and Wann	0.84	0.08
McCutchan-McLaughlin	1.63	0.10
Crenshaw	5.60	0.20
Cooper Lake	6.30	
Caddo I		
Ferguson	4.40	0.20
Morris	0.89	
Nagle	0.40	
Horton	0.57	
Caddo II		
Bentsen-Clark	1.74	0.14
Roden	2.40	0.22
Caddo IV		
Copeland Ridge-Hedges	7.60	0.43
Sam Kaufman	3.22	0.16
Kaufman-Williams	3.40	0.12
Roden	4.00	0.20
Caddo V		
Cedar Grove	11.80	0.43
Mississippian		
Hazel	7.7	0.48

Dental caries rates are the best indicator of an agricultural diet where the carbohydrate rich grains provide the ideal environment for bacterial growth on the tooth surfaces. Table 16-10 lists the caries rates per person and per tooth for 16 sites where comparable data were available from the literature. The rates per individual from Morris, Nagle, and Horton may be too low because the reports did not clearly state if these are caries per individual or carious teeth per individual. Since multiple caries per tooth is characteristic of the Caddo, the comparability of these three sites is in question. This table clearly demonstrates that Caddo dentitions have consistently higher caries rates than the Fourche Maline dentitions. In fact, with the exception of the three questionable sites, there is no overlap in caries rates between the Fourche Maline and Caddo.

The Caddo rates are also slightly lower than those from Mississippian groups of which one example (i.e., Hazel) is provided in Table 16-10. These data clearly indicate that all Caddo groups practice maize agriculture. Both Cedar Grove and the Copeland Ridge-Hedges sites (located in the Ouachita area of Arkansas) have typical Mississippian caries rates. In addition, the early Caddo sites (Crenshaw and Cooper Lake) have caries rates which approach the Mississippian level. These data suggest the hypothesis that maize consumption was highest at both the beginning and end of the Caddo era. The high caries rate at Cedar Grove again corroborates the high C-13/C-12 ratio indicating extensive maize utilization.

DENTAL PATHOLOGY AND ANTEMORTEM LOSS

Additional data were collected for calculus deposits, abscessed teeth and antemortem tooth loss (Table 16-11). Calculus is a calcified deposit along the gum line of the tooth formed by the interaction of saliva, food, and oral microorganisms. Excessive deposits can result in periodontal disease, alveolar resorption, and subsequent tooth loss. Apical abscessing is the consequence of inflammation of the dental pulp resulting from bacterial invasion by means of caries or pulp exposure due to rapid attrition. Abscessing invariably results in antemortem tooth loss.

Calculus deposits are common at Cedar Grove with 73.0% of the teeth effected. This rate is similar to other Caddo sites such as Cooper Lake (86.7%) and Ferguson (71.4%). Although comparative data are sparse, it seems that extensive calculus deposits are associated with high carbohydrate diets. The rate of dental abscessing at Cedar Grove is 1.4 per individual which is comparable to other Caddoan sites: Morris, 1.0; Cooper Lake, 2.6; Sam Kaufman, 1.2; and Kaufman-Williams, 0.4. In general Cedar Grove and the comparative Caddoan sites indicate that antemortem tooth loss can be attributed to caries which eventually lead to abscess and subsequent antemortem loss. In contrast, antemortem loss among the Fourche Maline can be attributed to abscessing caused by severe attrition exposing the pulp chamber (Powell and Rogers 1980).

DENTAL ATTRITION

The amount of dental attrition is an excellent indicator of the abrasive quality of prehistoric diets. These data are useful in isolating particular food preparation techniques such as the use of stone or wooden mortars. The Scott system of recording dental attrition was used as it appears to be the best interpopulational discriminator of the available techniques (Scott 1979). The Murphy system was also used because there is as yet no comparative data using the Scott system from the Arkansas-Oklahoma area (Murphy 1959). Mean scores are used despite the fact that the sample means are influenced by the age distribution, which is unknown for the comparative data. The use of means for Cedar Grove is particularly difficult because of the small sample size and the high proportion of older individuals. This demographic situation has inflated the

Table 16-11. Percentage of teeth with caries, calculus, abscessed, lost antemortem, and agenesis for Cedar Grove adults

Teeth	Total Possible Teeth	Total Teeth	Caries	Calculus	Abscessed	Lost Antemortem	Agenesis
Molars	102	88	102.0	62.5	3.2	6.9	5.7
Premolars	65	64	6.2	75.8	11.9	4.4	1.6
Canines	34	33	3.0	76.1	6.2	2.9	0.0
Incisors	68	63	17.5	83.9	1.5	4.4	1.6
Total	272	248	42.7	73.0	5.2	5.1	2.6

Table 16-12. Mean Scott attrition scores for maxillary and mandibular molars

Sites	M1	M2	M3
		Maxillary	
22LO530 (Rose 1981)	26.0	22.0	4.0
22IT537 (Rose 1981)	26.6	22.1	4.5
Indian Knoll (Scott 1979)	26.7	19.2	7.5
Cambell (Scott 1979)	19.3	15.1	4.2
Hardin (Scott 1979)	15.4	13.2	2.2
Cedar Grove	21.2	18.4	2.8
		Mandibular	
22LO530 (Rose 1981)	[illegible]	[illegible]	[illegible]
22IT537 (Rose 1981)	[illegible]	24.0	4.4
Indian Knoll (Scott 1979)	27.4	20.1	7.3
Cambell (Scott 1979)	17.6	14.6	3.0
Hardin (Scott 1979)	17.4	15.1	2.3
Cedar Grove	21.4	17.5	3.9

Table 16-13. Mean Murphy attrition scores for adults between 18 and 30 years of age (maxillary and mandibular molars combined)

Sites	M1	M2	M3
Sam and War[illegible]	6.9	[illegible]	1.9
McCutch[illegible]	[illegible]	5.9	2.3
Copeland [illegible]	2.5	1.5	0.1
Cedar Grove	1.25	[illegible]	0.0

Cedar Grove means because the attrition scores increase with the mean age of the individuals in the sample.

Examination of the mean Scott scores (Table 16-12) indicates that the Cedar Grove *attrition rate* is less than the prehorticultural Indian Knoll and the Woodland sites (22LO530 and 22IT537) from Mississippi. Examination of the mean Murphy scores for adults between 18 and 30 years of age (Table 16-13) shows that the Cedar Grove and Copeland Ridge-Hedges sites are clearly less worn than those from the Fourche Maline. The low Caddo rates can be attributed to the absence of stone grinding implements at Caddo sites and the postulated use of wooden mortars and pestles for preparing food (Schambach 1982). When the two Cedar Grove adults under 30 years of age are compared to the Copeland Ridge-Hedges series, the rates are similar. Thus when age is considered, the Cedar Grove sample has attrition rates typical of the Caddo. High attrition scores are characteristic of preagricultural societies and have been attributed to the coarse diet (unprocessed vegetable foods) and use of stone grinding implements. Agricultural societies tend to have lower attrition scores because of the use of processed grains, despite the fact that most such groups use stone grinding implements.

SCANNING ELECTRON MICROSCOPE ANALYSIS OF DENTAL ATTRITION

Observation of the occlusal surfaces of molars with the scanning electron microscope has made significant contributions to the reconstruction of prehistoric diets (Moore-Jansen et al. 1983; Rose et al. 1979; Ryan 1979; Walker 1976; Walker et al. 1978). This technique is still in the developmental stage and numerical analysis of striation patterns is not yet reliably replicable. Moore-Jansen et al. (1983) have been able to demonstrate that subjective comparisons of molar surface topography between prehistoric skeletal series can differentiate between certain dietary and food processing patterns. A summary of the previous analysis using this methodology on prehistoric southeastern skeletal series will precede the description and interpretation of the Cedar Grove microwear observations.

The Late Woodland of Mississippi is represented by two sites (22LO530 and 22IT537), whose subsistence pattern can be characterized as hunting and gathering, with the possibility of some agriculture (Rose 1981). The major subsistence resources appear to be hickory nuts and a wide variety of faunal species. Food processing utensils include stone mortars found at the sites. The enamel surfaces of

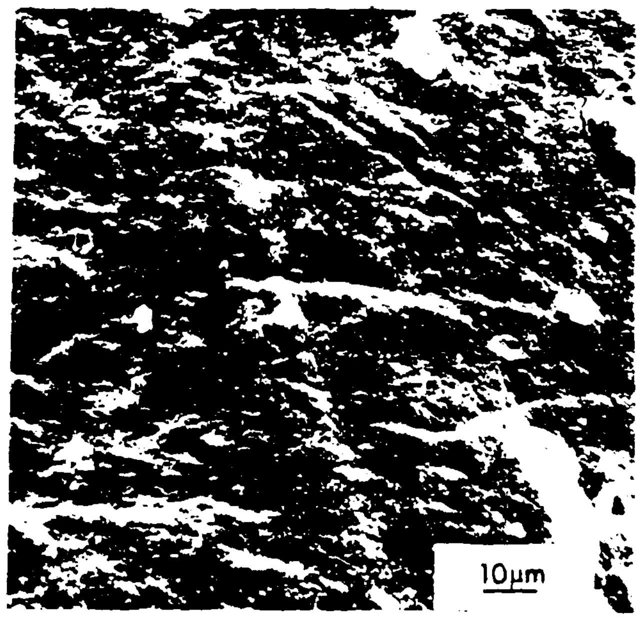

Figure 16-29. Mandibular molar surface from 22IT537 showing large rough surfaced striations and pitting of the enamel surface (1500X)

the mesio-lingual cusps of the second mandibular molars from both sites can be characterized as rough and pitted with a high frequency of striations (Figure 16-29). The striations vary in width from a maximum of 2.5 micrometers to unmeasurably small at 1500 magnifications. The margins of the striations are sharp and well defined with rough surface textures within the defined troughs. Large striations are slowly obliterated by numerous smaller ones. The enamel surfaces show little evidence of nonabrasive polishing except along the ridge crests and cusp margins.

The most dominant feature of the enamel surfaces is the numerous compression fractures observed in the intercuspal basins. It should be noted that this pattern is common to all individuals examined from these sites, Moore-Jansen (in Rose 1981) offered the following dietary interpretation for both 22LO530 and 22IT537. The absence of polishing indicates that plant fibers were either consumed in small quantities or were well processed (i.e., excessive cooking and grinding). The numerous and sharp, well defined, striations are attributed to the use of stone grinding implements and incidental contamination of food by dust and dirt. The frequent compression fractures are due to crushing small hard objects during mastication, in this case, specifically the utilization of nuts where pulverized hulls contaminate the food.

The Fourche Maline is represented by the Mahaffey site of eastern Oklahoma. The Fourche Maline is characterized as a hunting and gathering adaptation with the possibility of incipient agriculture (Wyckoff 1970). Specifically, the Mahaffey site produced evidence for the utilization of deer, smaller game, waterfowl, freshwater mussels, hickory nuts, walnuts, persimmon, plum, and some maize (Perino and

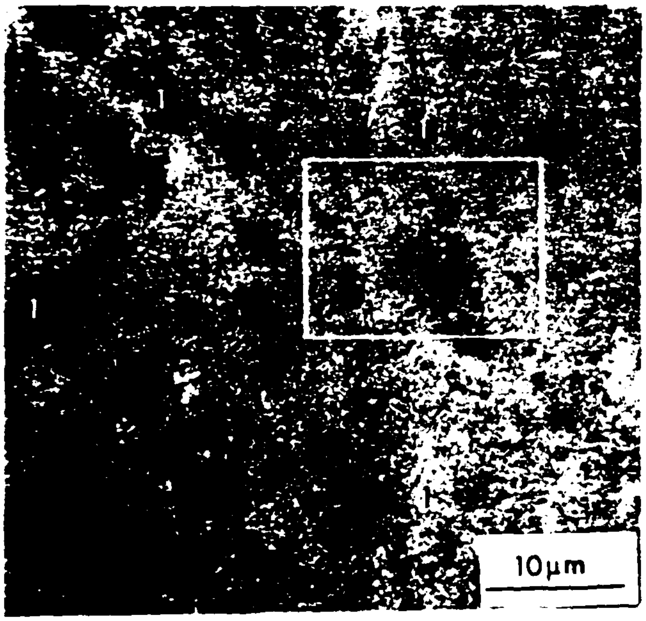

Figure 16-30. Mandibular molar surface from the Mahaffey site showing large smoothed out striations (1) absence of small striations, general smooth enamel topograhy, and faint raised enamel ends (2). The white box encloses the confluence of two large striations showing the typical 40 degree intersection angle (1500X)

Bennett 1978). The use of stone grinding implements is clearly in evidence. Moore-Jansen (Rose et al. 1981) describes the Fourche Maline molar surfaces as well polished with faint smooth striations and frequent raised circular areas which are the cross sections of enamel prisms (Figure 16-30). The frequent large striations are attributed to the use of stone grinding implements and possibly to grit derived from the consumption of shellfish. The extensive polish, which rapidly obliterates the striations, and produces the raised enamel prism cross sections, is attributed to the consumption of large quantities of vegetable fibers. The absence of compression-fractures in association with evidence for nut utilization may indicate that nut processing at Mahaffey was different from that used at the Late Woodland sites previously described. Although all the individuals examined from Mahaffey conformed to the above description, not all Fourche Maline skeletal series are the same.

The McCutchan-McLaughlin site, also from eastern Oklahoma (Powell and Rogers 1980), produced an entirely different microwear pattern from Mahaffey. The enamel surface topography can be characterized as rough with large striations, numerous small striations, and moderately frequent compression fractures (Figure 16-31). The striations, some as wide as 3.1 micrometers, have sharp well defined margins. There is some evidence of rounding of the striation margins (i.e., polishing) and there are frequent areas of flat enamel with no visible striations. The major difference between the McCutchan-McLaughlin and Late Woodland (i.e., 22LO530 and 22IT537) enamel surfaces is that the smooth areas of enamel are absent and the small striations more frequent on the Late Woodland molars. The McCutchan-McLaughlin pattern is interpreted as follows. The striations are attributed to the use of the stone grinding implements and the moderately frequent puncture fractures to the consumption of nuts evidenced in the midden deposits (Powell and Rogers 1980). The evidence of slight to moderate polishing suggests the consumption of vegetable fibers, but considerably less than the amount consumed at Mahaffey.

The Roden site represents both Caddo II and IV from eastern Oklahoma (Rose et al. 1981). The subsistence remains from Roden indicate the use of deer, small to medium sized mammals, turkey, fish, shellfish, persimmon, hickory nuts, maize, and beans, (Perino 1981). By far the most frequent of the botanical specimens was maize. The enamel surfaces, as described by Moore-Jansen (Rose et al. 1981), are characterized as rough and pitted with a high frequency of wear striations (Figure 16-32). The striation margins are sharp, while the enamel surface shows no evidence of polishing. The striations range from 2.0 micrometers to less than 0.1 micrometers in width. Puncture-fractures are moderately frequent in the intercuspal basins. It is obvious that old striations are slowly obliterated by more recent striations both large and small. Although, the Roden teeth superficially resemble the Late Woodland and McCutchan-McLaughlin molars, it should be recalled that the attrition rate at Roden is considerably less. Thus, unlike the Woodland teeth, the Roden striations would be removed much more slowly. This situation produced a high striation frequency at Roden, which when corrected for difference in the enamel removal rate, indicates a low frequency of abrasive particles in the Roden diet.

In summary, the Roden enamel surfaces appear to be produced by a low to moderate concentration of large hard particles within a relatively nonabrasive media (Rose et al. 1981). The soft nonabrasive diet is attributed to horticultural foods processed using wooden mortars and pestles (Schambach 1982). The striations result from accidental contamination of the foods by dust and dirt. The total absence of polishing suggests either the absence of vegetal fibers or extensive processing prior to consumption.

A total of 10 mandibular second molars from Cedar Grove were examined with the scanning electron microscope. These teeth represent Burial Groups C, D, and

Figure 16-31. Mandibular molar surface from the McCutchan-McLaughlin site showing large rough striations (S), numerous small striations (I) and compression fracture (circle) (1500X)

Figure 16-32. Mandibular molar surface from the Roden site showing large striations (S), and old obliterated striations (O), both showing absence of polishing (1500X)

Figure 16-33. Right mandibular second molar from Burial 4 showing rounded cusp, large striations, and no puncture-fractures (18X)

Figure 16-34. Right mandibular second molar from Burial 3 showing distinct striations (d), obliterated striations (O), and relative absence of small striations (I) (1500X)

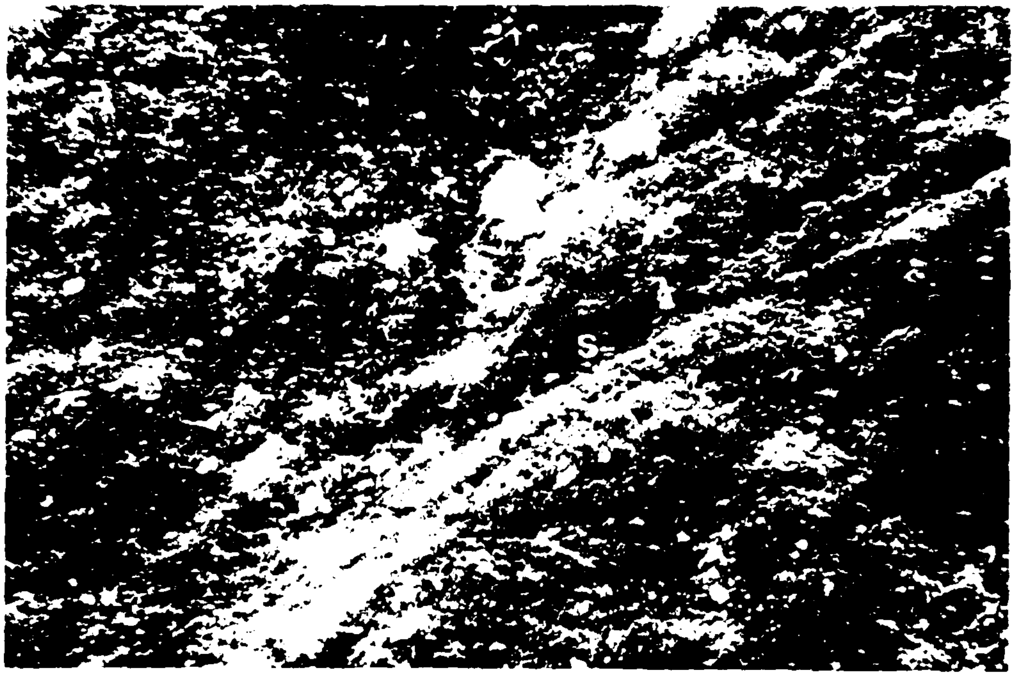

Figure 16-35. Right mandibular molar from Burial 8 showing numerous large striations (S), and small round elevations (e) (1500X)

E and will be described and discussed accordingly. Burial Group C (Burials 3,4,5,7,9,10) presents a relatively uniform array of molar surface textures which are all essentially the same. The low magnification (15-20X) micrographs show either flat or rounded mesiolingual cusps with large striations and few or no puncture-fractures (Figure 16-33). At 1500 magnifications a moderate frequency of large striations (0.5-4.0 micrometers) can be observed to crisscross the enamel surface at approximately 45° angles to each other (Figure 16-34). Some large striations are distinct with well defined features, while the majority are indistinct and nearly obliterated. The most obvious characteristic of these enamel surfaces is the low frequency of small (less than 0.5 micrometers) distinct striations.

The Group C dentitions from Cedar Grove are clearly distinct from the other cultures previously described and clearly resemble the molar from the Caddo IV occupation from the Roden site. Not only are the Group C striations less frequent, they are also never as deep and ragged as those from the Woodland sites and McCutchan-McLaughlin. A more dramatic difference is the greatly reduced frequency of small striations at Cedar Grove. There is also no evidence of nonabrasive polishing which does characterize Mahaffey and to a lesser extent the Woodland dentitions. In contrast to all the other sites there is no evidence of puncture-fractures. The Group D dentitions (Burials 11 and 12) are indistinguishable in all respects from those in Group C.

The two individuals from Group E (Burials 8 and 14) can be distinguished in two ways from the other Cedar Grove dentitions. First, large striations are more numerous in Group E than in C and D (Figure 16-35). Secondly, there are numerous small round elevations on the enamel surfaces of the Group E teeth. Close inspection reveals that the Group E elevations are produced by the intersection of large striations which lowered the surrounding enamel surface. The teeth closely resemble several from the Caddo II occupation at the Roden site.

The following dietary reconstruction is suggested by the microwear observed at Cedar Grove. The absence of puncture-fractures either indicates that nuts were not consumed on this farmstead or that they were prepared in a different manner from the Late Woodland sites from Mississippi. The moderate frequency of large striations and the low frequency of small striations suggests that stone grinding implements were not used to prepared food at Cedar Grove. The virtual absence of polishing suggests that vegetable fibers were not consumed or were well processed. The striations are attributed to accidental contamination of a relatively nonabrasive nonpolishing diet, which suggests the consumption of well processed agricultural grains such as maize. The subtle differences between the Group C-D and E dentitions suggests a slight dietary difference which can be attributed to dietary changes over time as Group E represents the earliest of the burial groups. In overall pattern the Cedar Grove micro-striation pattern clearly resembles Roden and differs significantly from 22LO530, 22IT537, Mahaffey, and McCutchan-McLaughlin. A more precise dietary reconstruction must await the development of an adequate analytical methodology.

ENAMEL MICRODEFECTS

Recent research has demonstrated the utility of microscopic defect analysis for the reconstruction of childhood morbidity patterns (Cook 1981; Lallo and Rose 1979; Rose et al. 1978; Rudney 1981). Dental enamel is a nonvital tissue that once formed is not remodeled and thus, like tree rings, contains a "memory" of its metabolic experience. Enamel is composed of enamel prisms which are laid down through the width of the crown by ameloblasts. The crystalline structure of the prisms reflects the metabolism of the ameloblasts at the time they were formed. Since each tooth crown is formed during a specific chronological period in the individual's life (i.e.,

mandibular canines between one and five years), any structural aberration can be assigned to a specific age (i.e., 2.5-3.0 years). This technique has the advantage of using the teeth of adults to reconstruct childhood metabolism and thus overcoming the problem of underrepresentation of children in archeologically derived skeletal samples. Rose (1977, 1979) defines a group of structural enamel prism defects (labeled Wilson bands) which are characterized by normal enamel prism structure along the striae of Retzius.

Rose et al. (1978) demonstrate an increase in Wilson bands at Dickson Mounds as the population experienced the transition from hunting and gathering to maize agriculture. Rose and Boyd (1978) showed that the chronological patterning of Wilson bands observed in adult teeth corresponded closely with the chronological distribution of unremodeled periostitis (i.e., active infection) among the large number of children from the Libben site, Ohio. The present interpretation of Wilson bands is that they are indicators of childhood infectious diseases. The frequency of childhood infections is determined by nutritional adequacy and overall childhood stress. Thus the pattern of Wilson bands will reconstruct the chronological pattern of childhood infections and the frequency of Wilson bands will estimate nutritional adequacy and childhood stress load. The major problem of Wilson band analysis has been their low frequencies making large samples necessary for pattern reliability. Both Condon (1980) and Rudney (1981) demonstrate that less severe enamel disturbances follow the same distribution as Wilson bands and can be used to solve the problem of low frequencies. Wilson bands have been redefined for this study using the definition of Condon (1980) and Rudney (1981).

The archeology and bioarcheology of Cedar Grove suggest two hypotheses which are tested with the Cedar Grove Wilson band data:

(1) The late date for the occupation of Cedar Grove suggests the possibility of contact with Europeans and thus the possibility of contact with European diseases. The presence of European diseases should produce a Wilson band pattern which differs from that of precontact North Americans. Wilson bands unlike skeletal lesions can be produced by European diseases.

(2) The demography and paleopathology suggest that the Cedar Grove subsistence-economic adaptation produced a slightly greater stress load than the Fourche Maline hunting and gathering adaptation and the same as earlier Caddo groups. This adaptation should produce Wilson band rates similar to other Caddo series and slightly greater than well adapted hunting and gathering groups.

A total of 12 mandibular canines and 11 maxillary central incisors from Cedar Grove were examined for Wilson bands. The Wilson band frequencies per one-half year of age for the Cedar Grove sample is presented in Table 16-14. The frequency of Wilson bands in the maxillary central incisors is presented in Table 16-15. The incisor data will not be discussed further because there is as yet little comparative data, and the chronological conversion chart is still tentative. It should be mentioned that the incisor pattern conforms to that obtained from the canines.

The study of the Libben site data is the largest and most extensive examination of Wilson bands using the new definition employed in the Cedar Grove analysis. A total of 112 canines produced 83 Wilson bands. The Libben site represents a well adapted Late Woodland subsistence-economic system from Ohio (A.D. 800-1100) with evidence of adequate nutrition, low infection and porotic hyperostosis rates, and a low probability of dying at all ages (Boyd 1978; Lovejoy et al. 1977). The Roden site is a typical Caddo site with evidence of maize agriculture and fairly extensive hunting and gathering (Perino 1981). A total of seven mandibular canines produced eight Wilson bands. At the present time these two sites have produced the only Wilson band data using the Condon-Rudney redefinition.

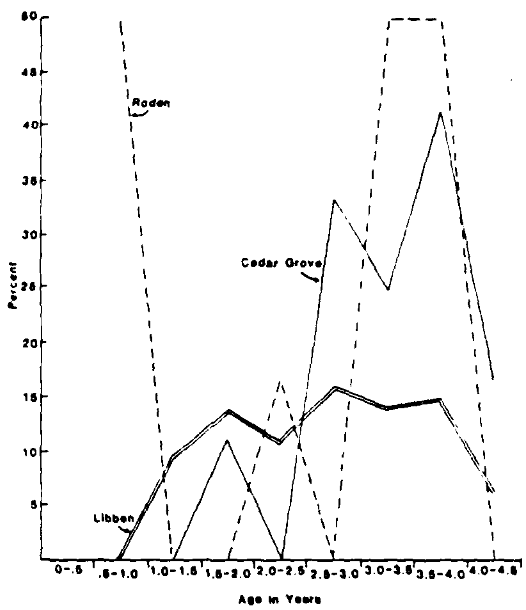

Figure 16-36. Percentage of Wilson bands per enamel unit

Table 16-14. Percentage of Wilson bands per enamel one-half year unit for canines

Sites	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5
	% N	% N	% N	% N	% N	% N	% N	% N
Cedar Grove	0.0	0.0 (7)	11.1 (9)	0.0 (10)	33.3 (12)	25.0 (12)	41.7 (12)	16.7 (12)
Roden	50.0 (2)	0.0 (3)	0.0 (4)	16.7 (6)	0.0 (7)	50.0 (6)	50.0 (6)	0.0 (12)
Libben	0.0 (37)	9.1 (55)	14.0 (86)	10.1 (99)	15.3(111)	14.4(111)	14.3(112)	6.2(112)

Table 16-15. Pecentages of Wilson bands per enamel one-half year unit for incisors

Sites	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5
	% N	% N	% N	% N	% N	% N
Cedar Grove	0.0 (3)	0.0 (6)	33.3 (9)	36.3 (11)	172.2 (11)	63.6(11)
Roden	0.0 (3)	0.0 (4)	16.7 (6)	66.7 (6)	16.7 (6)	40.0 (5)

Figure 16-36 shows the chronological pattern of Wilson bands from the Cedar Grove, Roden, and Libben skeletal series. The Libben pattern is based on a large sample and can be considered reliable. In fact, the distribution pattern of Wilson bands from two Late Woodland sites from Mississippi (22LO530 and 22IT537) is identical to the Libben pattern (Rose 1981). This pattern is also a reliable indicator of late childhood infections (post-1.5 years old) at the Libben site (Rose and Boyd 1978). Comparison of the Cedar Grove and Libben patterns show an overall similarity with frequency peaks at 1.75, 2.75, and 3.75 years. The relative differences in the frequencies is attributed to the small Cedar Grove sample size. The small Roden sample (i.e., seven) also shows a similar pattern. These data suggest that hypothesis 1 must be rejected as the postulated pattern change indicating the introduction of European diseases was not found.

Table 16-16 presents the percentages of Wilson bands per individual and one-half year enamel unit. These data indicate that Cedar Grove children experienced the same stress load as the Roden children, but a higher stress load than the well adapted Libben children. Consequently these imply that Cedar Grove experienced a similar level of adaptive efficiency as Roden but less than the Libben people. However, the pattern of childhood stress was similar at all three sites. A more comprehensive interpretation must await the accumulation of more comparative Wilson band data from Fourche Maline and Caddoan sites.

Table 16-16. Percentage of Wilson bands per individual and enamel one-half year unit

Sites	% Enamel Unit	% Individual
Cedar Grove	20.0 (75)	125.0 (12)
Roden	20.0 (40)	133.0 (6)
Libben	11.5 (723)	74.1 (112)

Table 16-17. Proportion of positive expression of nonmetric traits at Cedar Grove

	Group C	Group D	Group E
Epipteric Bone	0/2	0/1	0/1
Astertonic Bone	0/4	0/1	0/2
Parietal Notch Bone	0/4	0/1	0/2
Os Lambdoid Suture	1/4	0/1	1/2
Os Coronal Suture	0/4	0/1	0/2
Os japonium	0/4	0/1	0/2
Infra-orbital Suture	0/4	0/1	0/2
Parietal Notch	3/4	1/1	2/2
Supra-orbital Notch	4/5	2/2	1/2
Supra-orbital Foramina	2/5	0/1	1/2
Accessory Supra-orbital Foramina	1/4	0/1	0/2
Multiple Mental Foramina	0/6	0/1	0/2
Mylo-Lyoid Arch	2/6	2/2	0/2
Accessory Infra-orbital Foramina	4/4	0/0	0/2
Auditory Exostosis	1/4	0/2	0/2
Divided Hypoglossal Canal	3/3	0/1	1/2
Post-Condylar Canal not Patent	0/2	1/1	0/0
Foramen Ovale incomplete	0/4	0/1	1/2
Foramen spinosum open	1/4	0/1	1/2
Multiple Zygomatico-facial Foramina	2/4	0/1	1/2
Pterygo-alar spurs	1/1	1/1	0/0
Pterygo-spinous spurs	3/4	1/1	0/0
Metopic Suture open	0/5	0/1	0/2
Bregmatic Bone	0/4	0/1	0/2
Inca Bone	1/4	0/1	0/2
Apical Bone	1/4	0/1	0/2
Os sagital Suture	0/4	0/1	0/2
Mandibular Torus	0/5	0/2	0/2
Palatine Torus	0/4	0/1	1/2
Obelionic Foramina	2/4	0/1	1/2
Atlas: Lateral Bridging	1/5	0/1	0/2
Atlas: Posterior Bridging	0/3	0/1	0/2
C3: Accessory Foramina	1/6	0/1	0/2
C4: Accessory Foramina	4/6	1/1	0/2
C5: Accessory Foramina	3/5	1/1	1/2
C6: Accessory Foramina	3/6	1/1	1/2
C7: Accessory Foramina	3/5	1/1	1/1
Humerus Septal Aperture	1/5	0/2	0/1
L5: Spondglysis	0/3	0/1	0/1

GENETIC ANALYSIS

Since Laughlin and Jorgenson (1956) first used nonmetric traits to analyze regional population variation, nonmetric trait analysis has been frequently employed in bioarcheology (Berry 1968; Buikstra 1976; Finnegan 1974; Lane and Sublett 1972; Rightmire 1972; among others). In addition, analysis of the variation in dental morphology has been frequently used in bioarcheology to assess population affinities and origins (Turner 1970; Turner and Hanihara 1977; Turner and Swindler 1978; among others). Although both types of data have been frequently collected from Caddoan skeletal series no systematic analysis of Caddoan genetic affinities has been produced. The one attempt at tracing the genetic origins of the Caddo using cranial metrics produced an ambiguous answer to the question of Plains affinities for the Caddo (Loveland 1980). The present discussion will use nonmetric traits to interpret genetic variation between the Cedar Grove burial groups and between Cedar Grove and other Caddoan-Fourche Maline skeletal series.

Differences in location, grave orientation, and grave furniture have been used to divide the adult burials into three groups (i.e., C, D, and E) with Group E earlier than the other three. The nonmetric data were transformed into simple positive negative contrasts (i.e., positive one side only was recorded as positive) and totaled for the three burial groups (Table 16-17). Although the sample sizes are far to low for statistical analysis, differences in the proportions of positive scores can be used to suggest major genetic differences. Table 16-17 indicates that none of the differences between Groups C and D can be considered significant. Group E can be differentiated from C and D by the absence of three traits frequently observed in the other two (i.e., mylohyoid arch, accessory infra-orbital foramina; and accessory foramina in the fourth cervical vertebra). Although these differences suggest genetic distance between Group E and the other Cedar Grove adults, the samples are too small to calculate the probability of this hypothesis. In fact, concordance of the remaining 36 trait frequencies suggests homogeneity within the Cedar Grove series. Thus this minor difference can be attributed simply to random change over time (see Chapter 11). The dental morphology variation was not calculated because dental attrition reduced the number of observations below the minimum required frequencies. Inspection of the reported data (Appendix XII) reveals considerable homogeneity within the Cedar Grove series.

Examination of the Cedar Grove skeletal series reveals that it is characterized by a high frequency of morphological anomalies. Dental anomalies include: supernumerary mandibular premolar, agenesis of a mandibular central incisor, agenesis of a mandibular second molar (and hypodevelopment of its antimere), and three cases of malformation of mandibular premolars. Thoma (1950) and Pindborg (1970) indicate that both supernumerary teeth and agenesis of individual teeth are most commonly observed in oriental populations. The rates for both agenesis (18.2%) and supernumerary teeth (9.1%) at Cedar Grove do not exceed the rates reported for Japan (Pindborg 1970). The one trait for which no literature citation can

be found is the malformation (i.e., mesial portion of crown undeveloped) of the second premolars observed in Burials 8, 12, and 14. Group C has one supernumerary premolar (16.7%) while Groups D and E have no supernumerary teeth. Groups D and E both have an agenesis rate of 50.0%, while group C has a 0.0% rate. Both Group D (50.0%) and Group E (100.0%) have malformed premolars, while none were observed in Group C. These data suggest that Groups D and E might be differentiated from Group C. This difference may be associated with the high status of Group C individuals (see Chapter 13).

The Rhomboid fossae observed on the clavicles is an anomaly of unknown genetic or developmental origins, which are not uncommonly observed on the radiographs of modern Americans. The high frequency of this feature (30.8%) at Cedar Grove is unusual with only one other case reported for the Caddo (Horton site; Brues 1958). This trait occurs in the Cedar Grove burial groups in the following frequencies: A, 0/1; B, 0/1; C, 3/8; D, 0/1; and E, 1/2. These data suggest affinities between Burial Groups C and E if this trait has a genetic component.

Two femur anomalies are also frequently found at Cedar Grove: (1) destructive periosteal reaction just superior to the medial epicondyle; and (2) osteoid osteoma just superior to the medial epicondyle. Although the two traits are descriptively different, their common location and unknown etiology suggests that for the present they be considered together. The burial groups have the following frequencies of the femur anomaly: A, 0/2; B, 0/1; C, 4/5; D, 0/0; and E, 1/2. These data suggest affinities between Groups C and E (with no observations possible for Group D) if there is a genetic component for this trait.

The interpretation of the nonmetric traits and anomalies at Cedar Grove can be summarized as follows. The nonmetric skeletal traits suggest affinities between Groups C and D, with E being differentiated. The dental morphology suggests homogeneity for all three groups. The dental anomalies (i.e., supernumerary teeth; agenesis; and premolar abnormality) suggest grouping D and E with the exclusion of C. The distribution of the Rhomboid fossa and femur anomalies suggest grouping C and E while excluding D. Taken together these data establish genetic homogeneity of all the Cedar Grove burials. In fact the frequent occurrence of morphological anomalies within this small skeletal series indicates the presence of a family group as previously postulated in the demography section. Examination of the skeletal anomalies reveals that two adult males (Burials 7 and 14) have both a rhomboid fossa and femur anomaly, while one adult male (Burial 9) has the femoral osteoid osteoma without a corresponding rhomboid fossa. This suggests the possibility that the osteoid osteoma is not related to the femoral anomaly. In addition one young female (Burial 4) and one juvenile of unknown sex (Burial 10) also have both a rhomboid fossa and femur anomaly. This pattern suggests a linkage between the two anomalies, but more importantly suggests patrilocal residence. The nonmale possessors of the anomalies may be offspring too young to have married, while the older females (Burials 3 and 11) without the anomalies were marriage partners from outside. However, the frequent segregation of Group C by the nonmetric observations may be associated with their high status.

The present state of the art for Caddo bioarcheology makes a comprehensive survey of Caddoan genetic variation premature, but does encourage the formulation of testable hypotheses. Nonmetric skeletal traits are reported for three Caddo sites and three Fourche Maline sites within the Oklahoma-Arkansas Red River area. The data from the Sam Kaufman site could not be used because the number of observations were not reported when no positive occurrences of a trait were obtained. The data from the literature were transformed into simple positive negative contrasts where the unilateral appearance of a bilateral trait was recorded as positive. The seventeen most frequently reported traits are included in Table 16-18. McWilliams (1970) concludes that nonmetric analysis of the Sam and Wann Fourche Maline skeletal series indicates a common genetic heritage. Powell and Rogers (1980) conclude that when sample size is taken into consideration the McCutchan-McLaughlin skeletal series cannot be differentiated from the Sam and Wann series. The above authors suggest (implicit in their analysis) a common genetic heritage for the Oklahoma Fourche Maline with variation due to geographic distance. Small sample size and missing observations preclude statistical analysis of the three Caddoan series (Cedar Grove; Kaufman-Williams, and Bentson-Clark). Visual examination of Table 16-18 indicates that when a trait has a high frequency (i.e., Os Lambdoid), it is high for all three sites, while traits with low frequencies (i.e., Multiple Mental Foramina) are low at all three sites. These data suggest the hypothesis of a common genetic origin for the Caddo. Furthermore, the data presented in Table 16-18 suggest the hypothesis that the genetic origin of the Caddo will be found within the local Fourche Maline populations.

Table 16-18. Nonmetric traits for Fourche Maline and Caddo skeletal series

	Sites					
	Cedar Grove	Kaufman-Williams	Bentsen-Clark	Wann	Sam	McCutchan-McLaughlin
Epipteric Bone	0.0 (0/4)		66.7 (2/3)	0.0 (0/4)	7.7 (2/26	0.0(0/5)
Asterionic Bone	0.0 (0/7)	29.4(15/51	0.0 (0/3)	18.3 (6/32)	4.0 (2/50)	0.0(0/8)
Parietal Notch Bone	0.0 (0/7)	16.7 (8/48)		0.0 (0/34)	0.0 (0/60)	15.4(2/13)
Os Lambdoid	28.6 (2/7)	23.5(12/58)	66.7 (2/3)	85.0(34/40	95.0 (7/80)	20.0(2/10)
Os Coronal	0.0 (0/7	2.3 (1/43)		16.7 (6/13)	9.7 (6/62)	16.7(1/16)
Supra-orbital Foramen	37.5 (3/8)		57.1 (8/14)	36.8(14/38)	35.1(26/74)	33.3(6/18)
Multiple Mental Foramina	0.0 (0/10)	3.7 (2/54)	10.7 (3/28			
Mylo-hyoid Arch	40.0 (4/10)	3.7 (2/54)	33.3 (6/18)			
Accessory Infra-orbital Foramina	66.7 (4/6)			0.0 (0/4)	0.0 (0/2)	33.3 (0/6)
Auditory Exostoses	12.5 (1/8)	5.7 (3/53)	17.6 (3/17)	19.0 (8/42)	15.0(12/80)	0.0(0/19)
Post-Candylar canal not patent	33.3 (1/3)		16.7 (1/6)	100.0 (6/6)	33.3 (4/12)	0.0 (0/5)
Foramen Ovale incomplete	14.3 (1/7)		0.0 (0/5)	0.0 (0/6)	0.0 (0/8)	0.0 (0/9)
Foramen Spinosum open	33.3 (2/6)			66.7 (4/5)	25.0 (2/8)	0.0 (0/9)
Metopic suture open	0.0 (0/8)		0.0 (0/15)	0.0 (0.20)	0.0 (0/39)	0.0(0/21)
Bregmatic Bone	0.0 (0/7)		0.0 (0/3)	0.0 (0.18)	0.0 (0/38)	0.0(0/15)
Inca Bone	14.3 (1/7)	0.0 (0/51)	0.0 (0/3)			
Mandibular Torus	0.0 (0/9)	9.2 (5/54)		22.2 (4/18)	5.9 (2/34)	33.3(4/12)
Palatine Torus	14.3 (1/7)	6.1 (3/49)		0.0 (0/9)	18.8 (3/16)	12.5 (1/8)

The high frequency of both dental and skeletal anomalies at Cedar Grove suggest that these phenomena deserve much more attention in Caddo bioarcheology than they have been given in the past. Examination of Table 16-19 indicates that both agenesis and supernumerary teeth are fairly common among the Caddo. Although the dental anomaly rates are not exceptionally high, they are almost always found in Caddo skeletal series from eastern Oklahoma and western Arkansas (author's personal observation using unpublished data). In contrast, the author has seldom observed these traits in skeletal series from Mississippi, eastern Arkansas, or Illinois. Unfortunately, dental anomaly data are not consistently or uniformly published and this hypothesis cannot be tested from the extant literature. In addition other skeletal anomalies such as the Rhomboid fossae from Cedar Grove and vertebral anomalies from Kaufman-Williams (Loveland 1980) are very frequent. It should be mentioned that the most frequent anomaly is never the same at two Caddo sites. These preliminary observations suggest the hypothesis that the Caddo followed a set of mate/marriage rules that tend to pair individuals with close genetic/kinship ties. Whatever these rules may be, they appear at present to be unique to the Caddo. Detailed analysis of mortuary practices, social status differentiation, and nonmetric dental-skeletal traits should provide sufficient data to test the proposed hypothesis, as well as suggest possible marriage rules for the Caddo.

Table 16-19. Rates per individual for supernumery teeth and agenesis

Sites	Agenesis %	Supernumery Teeth %
Wann and Sam	0.0	1.9
Morris	0.0	0.0
Nagle	0.0	0.0
Horton	0.0	0.0
Belcher Mound (Belcher I)	10.0	0.0
Belcher Mound (Caddo IV)	0.0	2.8
Copeland Ridge	10.0	5.3
Sam Kaufman	4.3	0.0
Kaufman-Williams	1.3	1.3
Cedar Grove	18.2	9.1

CONCLUSIONS

The analysis of the Cedar Grove skeletal series has attempted to test a series of three hypotheses concerning: (1) the genetic-demographic status of Cedar Grove; (2) the degree of dependency on a maize diet; (3) the adaptive fitness of the Cedar Grove cultural system; and (4) the possible presence of European diseases at Cedar Grove. Comparison of Cedar Grove with previously published reports on Fourche Maline and Caddo skeletal series served to produce five additional areas of investigation, which can be tested during the course of future research. These hypotheses include: (1) the derivation of the Caddo from local Fourche Maline populations; (2) major changes in settlement and socioeconomic systems during the early Caddo periods; (3) increased reliance on maize during the early Caddo periods as well as by Caddo groups during later Caddo occupations; (4) increased stress and reduced adaptive fitness during the protohistoric period, and (5) the Caddo practiced marriage customs that encouraged inbreeding.

The first problem to be addressed by bioarcheologist and archeologist alike is the genetic/population origins of the Caddo. Brues (1958) was the first to suggest a Plains origin for the Caddo. Loveland (1980) was not able to demonstrate conclusively whether or not three large Caddo skeletal series had genetic affinities with the Caddoan speaking peoples of the Plains. Because of the insufficiency of comparative data, the present study was not able to statistically examine the genetic affinities of the Caddo. However, preliminary analysis of dental and skeletal nonmetric traits suggests that the Fourche Maline of Oklahoma are a coherent genetic group, and that there is no reason to suggest that Cedar Grove and two other large Caddoan skeletal series could not be derived from local Fourche Maline populations. It is proposed here that future analyses attempt to specifically test the hypotheses that the Caddo were derived from their Fourche Maline predecessors.

The Cedar Grove burials are divided into five groups on the basis of horizontal provenience, grave orientation, and grave goods. In fact, Group E (Burials 8 and 14) are possibly Caddo IV rather than Caddo V, because their ceramic grave goods are slightly earlier types than found in the other burials (Chapters 11 and 12). Analysis of nonmetric skeletal traits, dental morphology, dental and skeletal anomalies demonstrates that the Cedar Grove sample is a genetically homogeneous group, with the possible exception of Group C which is identified as high status. The high frequency of skeletal and dental developmental anomalies further indicates that Cedar Grove should be considered a family cemetery utilized by the inhabitants of the farmstead. In fact, the co-occurrence of the clavical and femur anomalies in two older males, one juvenile, and one young female indicate patrilocal residence. The high incidence of developmental anomalies at both Cedar Grove and other Caddoan sites suggests the hypothesis that the Caddo followed marriage rules which encouraged pairing between close genetic relatives.

Demographically the Cedar Grove sample has too few females and children when compared to a normal population profile. Examining the age and sex distribution by individual burial group suggests that the Cedar Grove sample was derived from a family group occupying the farmstead over a period of years. This demographic profile shows a close similarity to small nineteenth century family cemeteries from northwest Arkansas. This conclusion is further supported by the previously mentioned genetic analysis. However, if the Cedar Grove site is considered a high status compound the low proportions of females and children may be explainable.

Cedar Grove is similar to other Caddoan skeletal series which also produced too few females and children. This common pattern abnormality deserves close attention in the future and demonstrates the need for comprehensive analysis of Caddoan demography, social organization, and mortuary customs. Comparison of crude life tables from the Fourche Maline, Caddo II, and Caddo IV periods suggest systematic changes in adaptive fitness over time. The childhood probability of dying for the Fourche Maline is similar to other Woodland groups and indicates a moderate to high degree of adaptive efficiency. The higher probability of dying for the Caddo II suggest a decline in adaptive efficiency, which is increased during the Caddo IV period. Using a model developed for the Late Woodland-Mississippian transition in the Midwest, this fluctuation in adaptive fitness indicates that the early Caddo peoples were involved in major changes of subsistence, settlement pattern, and social organization. In contrast the Caddo IV represent a return to a level of adaptive efficiency characteristic of the Fourche Maline. This hypothesis requires detailed testing with both archeological and bioarcheological data.

The paleopathology data also support the above hypothesis. Although the adult infection rates of the Caddo IV samples are slightly higher than the Fourche Maline, they are all lower than the Caddo II rates. Considering the small sample size of Cedar Grove, the infection rate is compatible with the Caddo IV material. In contrast the porotic hyperostosis rates (i.e., iron deficiency anemia) systematically decline over time: Fourche Maline, 24.3%; Caddo II, 15.2%; and Caddo IV, 10.4%. Since iron deficiency anemia is causally linked to the iron binding quality of maize (i.e., the dietary iron is made biologically

unavailable), these data suggest one of three possible explanations: (1) reliance on maize declined over time; (2) the processing of maize changed over time (i.e., lime processing which makes the iron bioavailable); and (3) iron rich foods such as meat increased in the diet in quantity over time. The high stable carbon isotope ratios from Cedar Grove (Chapter 17) in conjunction with the frequent evidence for maize at the site (Chapter 14) indicate that maize consumption did increase over time at least at Cedar Grove. The reliance on red meat rather than other protein sources such as fish (Chapter 15) suggests that porotic hyperostosis did not occur at Cedar Grove because of adequate dietary iron. The systematic increase in osteophytosis (i.e., degenerative destruction of the vertebrae) from the Fourche Maline to Caddo V indicates a systematic increase in "back stress" which could be related to a change in subsistence patterns.

The caries rate of a population is the only available indicator of the proportion of agriculturally derived carbohydrates in the diet of a prehistoric culture. The Fourche Maline sample have low caries rates, high proportions of interproximal caries, and high dental attrition rates, which are all characteristic of nonagricultural subsistence patterns. All the Caddo samples have caries rates higher than the Fourche Maline. Several high caries rates among the Caddoan samples suggest further testable hypotheses. The high Caddo I rate indicates greater maize utilization by the early Caddo, which has also been suggested by their greater demographic stress and higher infection rates. The higher rates for the two series from the Ouachita Mountain region of Arkansas (i.e., Copeland Ridge and Hedges) presents the possibility that upland Caddo utilized more maize than those along the Red River. The higher rate for Cedar Grove presents the possibility for greater maize consumption during the Caddo V period, which is supported by both the stable carbon isotopes and the frequent occurrence of maize at the site.

The micro-striation pattern observed with the scanning electron microscope provides the following reconstruction of the physical characteristics of the Cedar Grove diet. The diet consisted of nonabrasive soft foods which were not prepared with stone implements. The absence of polishing and compression fractures indicates either a low consumption of nuts and vegetable fibers or an extensive processing technology which differs from that employed by the Fourche Maline of Oklahoma and Late Woodland peoples of Mississippi. The Cedar Grove pattern is homogeneous and identical to the Roden pattern from both the Caddo II and IV occupations. These data suggest an overall stability of the Caddoan diet during the later periods.

Finally, the Wilson band data indicate that childhood stress levels were similar at both the Cedar Grove and Roden sites, but higher than the well adapted Late Woodland peoples from the Libben site, Ohio. More extensive interpretation must await additional comparative Wilson band data. The correspondence of the chronological patterning of Wilson bands among the Libben, Roden, and Cedar Grove samples in conjunction with skeletal pathologies and demography do not suggest the presence of European diseases.

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Chapter 17

CEDAR GROVE CHRONOMETRICS

Daniel Wolfman

INTRODUCTION

Ceramic crossdating indicates that the Caddo IV/V material at the Cedar Grove site probably dates between A.D. 1650 and 1750; however, the absence of European trade goods suggests the possibility that the Caddo IV/V component may be earlier. Consequently, the application of absolute dating methods was clearly indicated. Unfortunately, accurate dating in this time period in Arkansas is very difficult.

Dendrochronology, when the proper samples are available in a region whose master chronologies have been developed, is unquestionably the best approach. While master chronologies for several species have been developed in Arkansas as far back as the fifteenth century (Stahle 1979; Stahle et al. 1982; Stahle and Wolfman 1983) suitable samples have never been recovered from excavations in this state. In an attempt to date the Cedar Grove site, three other dating methods--radiocarbon, thermoluminescence, and archeomagnetism were tried. As discussed below, only the thermoluminescence results were satisfactory. While consistent with post-A.D. 1650 date for the Caddo IV/V component, they do not exclude the possibility that some of the material may be somewhat earlier.

The terms "precision" and "accuracy" are used throughout the following discussion. They are often used interchangeably by archeologists (and others who should know better) or lumped in a single category called error. Precision refers to the repeatability of a result and accuracy, its "truth." The precision and accuracy of chronometric results depend on several factors. Often some of them cannot be exactly determined. Generally, random errors reduce precision whereas systematic errors reduce accuracy, however, some errors may reduce either precision or accuracy depending on the particular situation. Systematic errors encountered in radiocarbon dating have recently been reviewed by Browman (1981) while Pearson (1979) has discussed the statistical (random) errors for this dating method. Aitken and Alldred (1972) have discussed systematic and random errors in thermoluminescence measurements and I (Wolfman 1982:278-285) have discussed these errors in archeomagnetic dating.

Stylistic and stratigraphic information indicates the following relative chronology for burials and features containing the chronometric samples analyzed at the Cedar Grove site. The burials, on the basis of ceramics, have been placed in three groups: I, II, and III (early to late).

Group I: Burials 14 and 8
Group II: Burials 11, 12, and 15
Group III: Burials 1 through 5, 7, 9, and 10

Features 17 and 18 and Burial 15 are within the only aboriginal structure excavated at the Cedar Grove site and, therefore, contemporaneous. The midden levee transect is stratigraphically later than all the burials.

RADIOCARBON DATING

Radiocarbon dating is the most widely used chronometric method in archeology (see Polach 1976 and Browman 1981 for authoritative reviews of this method). Throughout the following discussion, it is assumed that the reader is familiar with the problems associated with secular variation of the carbon-14 content in the atmosphere and its effect on radiocarbon dating. This problem, which was first recognized by de Vries (1958), has been reviewed many times since then (e.g., Suess 1965; Olsson 1970; Damon et al. 1974). Recently, new (and presumably very accurate) calibrations of the radiocarbon time scale have been published (Stuiver 1982; Klein et al. 1982). It is further assumed that the reader is familiar with the effect of isotopic fractionation on radiocarbon samples and what isotopic ratios can tell use about the diet of prehistoric populations (see Bender 1968; DeNiro and Epstein 1978; Vogel and Van der Merwe 1977 for discussions of these topics).

Since the concentration of carbon-14 in the atmosphere has, on the average, declined since A.D. 1650 at about the same rate as the decay of this isotope, radiocarbon dates on material which grew at any point during this time period differ by less than the errors normally encountered. See Figure 17-1 which compares dendro ages with radiocarbon ages for A.D. 1200-1950. As indicated on this figure, the concentration of carbon-14 decreased at such a rapid rate between 1600 and 1700 that the carbon-14 ages of material which grew at either end of this interval differ by about 225 years. Radiocarbon ages of material whose true ages are 1600 and 1650 differ by about 100 years. Furthermore, the radiocarbon ages of material which grew between 1500

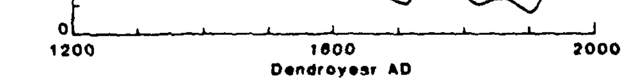

Figure 17-1. Radiocarbon age vs. dendro-age of Pacific Northwest Douglas fir and California sequoia, A.D. 1200-1950 (after Stuiver 1982:6-7)

and 1650 differ little but there is a sharp difference (ca 225 years) between radiocarbon dates of material which grew in 1375 and 1500.

Radiocarbon dates with a precision of ca ± 40 years at the 67% confidence level can be obtained routinely. Consequently, with many good short lived samples and careful lab work designed to maximize precision and accuracy, it may be possible to distinguish material which dates to ca A.D. 1650 from material which grew at 1600 or earlier. Coupled with cultural information it might be possible to identify a short lived sample which grew at ca A.D. 1700.

For very precise and accurate dating, short lived samples are required. Wood charcoal is generally the best material for radiocarbon dating and the few charcoal samples submitted were all from wood which was short lived. Unfortunately, not much wood charcoal was recovered in the Cedar Grove excavations. However, abundant well preserved human bone was recovered. There is considerable variation in carbon turnover in collagen in different bones in the body; consequently, the precision of the date obtained depends to some extent on the bone from which the sample was taken. The most rapid turnover is in spongy bone, (such as is found in ribs, scapulae, and vertebrae) and the slowest in the shafts of long bones.

While there has been some discussion about the reliability of results obtained on bone, some experts (e.g., Taylor and Slota 1979:430) feel that with adequate precaution reliable results can be obtained with this material. Since Rainer Berger was among the first to obtain good results with bone (e.g., Berger et al. 1964) and is among those who believe that reliable results can be obtained with this material, the samples were sent to his radiocarbon laboratory at the University of California at Los Angeles.

Fourteen samples (12 from the Cedar Grove site, 3LA97, and two from 3LA128) were submitted to the University of California at Los Angeles radiocarbon lab (Table 17-1). Five of these samples were from Features 17 and 18 and Burial 15, which lie within the only aboriginal structure excavated at the Cedar Grove site. This group of five samples (and perhaps a sixth from Burial 12 which on the basis of associated cultural material is thought to be contemporaneous with Burial 15) when submitted were thought to provide an opportunity for averaging to improve the precision of the individual results. Samples submitted from Burials 8 and 14, and Burials 4, 9, and 10, and the midden levee transect should have provided additional opportunities for averaging and comparison of material of different ages.

Radiocarbon Results

In order for the data to be useful for our problem, precise and accurate results were needed. The results from the 14 samples submitted are summarized in Table 17-1. The data were reported in counts per minute (Column 4,) and for the bone samples C-13/C-12 ratios were also reported (Column 5). Using standard formulas, C-14 ages with 67% confidence limits were calculated (Column 6). The one sigma values reported are based entirely on counting statistics. Unfortunately, these radiocarbon determinations were extremely imprecise. Ordinarily, radiocarbon results are measured with one sigma value of less than 1% (which is equivalent to ± 80 years). The mean sigma values for the 14 samples is 433 years. This is by far the worst group of samples in this regard of which I am aware. Professor Berger commented that some of the samples were small and that a small counter was used for all samples. A larger counter and longer counting times presumably would have improved some and perhaps all of the results. Given the poor precision of the results, the exact time span during which carbon was incorporated in the bone and charcoal samples need not be considered.

The mean radiocarbon age for each sample, with one exception, is more recent than A.D. 1650. However, with only one exception the lower ends of the one sigma confidence limits are earlier than 1650. In addition, the mean date for 12 of the 14 samples is later than 61 B.P. Due to the relatively low C-14 concentration in the atmosphere in the past few hundred years, all samples should have a C-14 of 100 B.P. or earlier. The fact that almost all of them do not suggests that there may be a systematic error which is making the results younger than they should be. Humic or fulvic acid contamination, which is difficult to completely remove from bone (Haynes 1967; Olsson et al. 1974) and apparently is not always removed from charcoal using standard pretreatment techniques, is a possible source of such error.

Finally, it should be noted that the C-13/C-12 ratios in the bone samples varied between -12.84 °/oo and -16.04 °/oo. These values, which are extremely low, suggest a diet heavily dependent on C-4 plants (Vogel and Van der Merwe 1977; DeNiro and Epstein 1978), most probably maize. Since some of the samples are apparently contemporaneous they can be averaged (Long and Rippeteau 1974). Arithmetic rather than weighted means were calculated (Table 17-2, Column 3). Since the precision is so poor and the low values are all of similar magnitude, it did not seem worth the extra time to calculate the weighted means. The precision of these combined results (Table 17-2, Column 3) are somewhat improved compared to the individual dates.

Table 17-1. Radiocarbon results from the Cedar Grove site (3LA97) and Sentell (3LA128)

Lab Number	Survey Number	Provenience	CPM ± σ	C-13/C-12	C-14 Age ± σ
2357A	B4-806	Burial 4	0.968 ± 0.041	-15.32 °/oo	-18 ± 434
B	B10-1157	Burial 10	0.983 ± 0.043	-16.04	+119 ± 443
C	B9-1196	Burial 9	0.928 ± 0.042	-14.41	-372 ± 452
D	B12-1208	Burial 12	0.970 ± 0.043	-14.68	-13 ± 449
E	B8-775	Burial 8	0.978 ± 0.044	-14.47	-46 ± 453
F	80-1209-209	Midden Levee Trans. Unit 12	0.959 ± 0.033		+62 ± 382
G	80-1209-1451	Feature 18	0.945 ± 0.034		-50 ± 395
H	81-751-57	3LA128 Postmold	0.956 ± 0.041		+36 ± 440
I	81-751-104	3LA128 Feature 6	0.058 ± 0.031		+55 ± 374
J	80-1209-1450	Feature 18	0.944 ± 0.043		-61 ± 452
K	80-1209-1388	Bottom of Feature 17	0.961 ± 0.038		+85 ± 412
L	80-1209-1449	Feature 18	0.961 ± 0.044		+83 ± 453
M	B14	Burial 14	0.952 ± 0.053	-12.84	-199 ± 522
N	B15	Burial 15	0.970 ± 0.036	-12.92	-39 ± 401

Note: In the last column, six negative C-14 ages are years before A.D. 1950, while positive C-14 ages are years after A.D. 1950.

Table 17-2. Average radiocarbon dates for Cedar Grove (3LA97) and Sentell (3LA128)

Provenience	Lab Numbers	Average C-14 date $\pm\sigma$
Features 17 and 18; Burial 15	2357 G,J,K,L, and N	+4 $\pm$ 188
Features 17 and 18; Burials 12 and 15	2357 D,G,J,K,L, and N	+1 $\pm$ 173
Burials 8 and 14	2357 E and M	- 76 $\pm$ 350
Burials 4, 9, and 10	2357 A,B, and C	-90 $\pm$ 256
All of the above	2357 A,B,C,D,E,G,J,K,L,M, and N	-41 $\pm$ 133
3LA128 postmold and feature	2357 H and I	+46 $\pm$ 285

The mean result for the five samples from within the structure at the Cedar Grove site and the mean of all samples at the Cedar Grove site (Table 17-2) are compatible with a calendar age of A.D. 1650-present and exclude the possibility of a pre-A.D. 1650 date at the one sigma (but not two sigma) confidence level. This conclusion is based purely on the random statistical errors. Consequently, the placement of the Caddo IV/V component at the Cedar Grove site in the A.D. 1650+ time period is weakly supported.

Due to the lack of associated cultural material and poor precision of the dates, little can be concluded about the C-14 results from the two samples collected at 3LA128. However, if the samples are contemporaneous, since the average result for the two samples is 46 $\pm$ 285, there is weak support for their being later than A.D. 1650.

THERMOLUMINESCENT DATING

Thermoluminescent dating provides the archeologist with an opportunity to obtain dates directly on culturally significant material. Problems of the nature of association of charcoal used in radiocarbon or tree-ring dating with events of cultural importance are thus avoided.

A review article by Seeley (1975) and a chapter in Martin Aitken's text, Physics and Archaeology (Aitken 1974:85-134), provide good discussions of the thermoluminescent dating method.

Traditional thermoluminescent dating involves measuring stored radioactive damage, usually in quartz inclusions extracted from pot sherds. Since the radiocarbon damage increases with time, the thermoluminescent signal is stronger in older samples. For very young samples, the signal may be too weak to measure. For quartz crystals, this method is rarely used on samples younger than ca 1500 years old. However, calcite is a more sensitive thermoluminescence dosimeter than quartz. The thermoluminescence signal from fragments of calcitic shell temper is further enhanced, compared to quartz inclusions, because they are larger. Recently, Ralph Rowlett at the University of Missouri Thermoluminescence Laboratory has been obtaining good results on calcitic shell temper extracted from pot sherds. When we first contacted him about this project over a year ago, he had just obtained excellent results on some Fort Ancient samples from West Virginia.

Shell tempered pot sherds from three Cedar Grove proveniences, Features 17 and 18 and midden in Levee Transect Unit 12, were submitted to the University of Missouri Thermoluminescence Laboratory. As noted above, Features 17 and 18 are considered contemporaneous. On stylistic grounds, the ceramics from Unit 12 are thought to be somewhat later than Features 17 and 18.

Thermoluminescence Results

The results which are presented in Table 17-3 agree very well with the age estimate made on the basis of associated cultural material prior to submission of the samples for dating.

Three samples of shell, each from a different sherd, from each provenience were measured. The data reported by the University of Missouri lab (Table 17-3) are an average date and a precision parameter which only incorporates measurable random error (Table 17-3, Column 4). A weighted average date was calculated for each provenience and a pooled standard deviation for this average, σr, was also calculated using standard formulas (Long and Rippeteau 1974:209). σr only accounts for random errors. As Aitken and Alldred (1972) and others have noted, there are systematic errors (σs) included in the results as well. While it is not always possible to quantify these systematic errors, Rowlett (personal communication) suggests that they are on the order of 5% of the age of the sample. This is consistent with Aitken's (1974:113) estimate of 7% for the overall error:

$$\sigma = \sqrt{\sigma s^2 + \sigma r^2}$$

Table 17-3. Thermoluminescent dates for Cedar Grove (3LA97)

Lab Number	Provenience	Survey Number	TL Date
MATL81-6-7A	Feature 18	80-1209-1385	1670 $\pm$ 40
81-6-7B		80-1209-1385	1520 $\pm$ 50
81-6-7C		80-1209-1385	1710 $\pm$ 40
81-6-5A	Feature 17	80-1209-671	1590 $\pm$ 50
81-6-5B		80-1209-671	1620 $\pm$ 40
81-6-5C		80-1209-671	1580 $\pm$ 55
81-6-6A	Midden Levee Transect Unit 12	80-1209	1770 $\pm$ 30
81-6-6B		80-1209-31	1700 $\pm$ 30
81-6-6C		80-1209	1760 $\pm$ 30

When reporting an average thermoluminescent date for a provenience, Aitkin (1974:112-113) established the convention of reporting two error parameters. The first is the standard error of the mean. The second parameter is

overall error $\sigma = \sqrt{\sigma_s^2 + \sigma_r^2}$

These data are displayed as the average date followed by the standard error and the overall error in parenthesis in that order (Table 17-4). That the standard errors are small for the Feature 17 and Unit 12 samples is very encouraging. The larger standard error for the Feature 18 sample suggests that the 1520 thermoluminescent date may be due to systematic error. However, elimination of the specimen which gave this result from the sample cannot be justified on the basis of standard statistical criteria, nor does it seem wise to do so since there are only three specimens in this sample.

Table 17-4. Average thermoluminescent dates for Cedar Grove

Provenience	Average Date
Feature 18	A.D. 1641 (±58, ±30)
Feature 17	A.D. 1599 (± 9, ±33)
Midden Levee Transect Unit 12	A.D. 1749 (±22, ±21)
Features 17 and 18	A.D. 1621 (±28, ±27)
Features 17 and 18 (without A.D. 1520 date)	A.D. 1639 (±25, ±26)

Since Features 17 and 18 are considered contemporaneous, the results were combined. The weighted average date of 1621 for these two features with a standard error of 28 years and an overall error of 27 years is compatible with the suggested dating of 1650-1750 for the Caddo IV/V component at the site. *However, it does not exclude the* possibility of an earlier date.

While the 1520 thermoluminescent date should not be excluded from the combined Feature 17 and 18 sample because it is less than 1.95 standard deviations from the mean, even if this were done it would not change the weighted average date significantly (Table 17-4, line 5).

Interestingly, the date on the midden in Levee Transect Unit 12 using the t-test, is significantly later than the weighted average date for Features 17 and 18 combined at the 90% (but not the 95%) confidence level (Long and Rippeteau 1974:210-211). This result is, of course, consistent with relative dating based on ceramic styles.

ARCHEOMAGNETIC DATING

The archeomagnetic dating method has recently been discussed by Wolfman (1982) and Eighmy et al. (1980). A comprehensive review of this method (Wolfman 1983) will be published in the near future.

The archeomagnetic method is capable of dating baked clay features with high precision and accuracy. However, as discussed in the above cited references, this can only be achieved after a curve of secular variation of geomagnetic direction for the region and time period of interest has been constructed. While such a curve for A.D. 1200-1500 time period in Arkansas is now available (Wolfman 1982) the curve for A.D. 1500-1900 has yet to be developed. Consequently, if good results had been obtained from the Cedar Grove archeomagnetic sample they would have been helpful in constructing the curve in this time period. However, dating of the sample would have had to await *development of a significant portion of the A.D. 1500-1900* curve.

In late December of 1980, Michael Swanda and Frank Schambach collected an archeomagnetic sample consisting of eight individually oriented specimens from Feature 18. I subsequently measured the sample (Lab. No. CG135) in the rock magnetism lab at the University of California at Santa Barbara.

The remanent magnetic directions in the eight specimens in this sample are so widely divergent that it seems likely that they were collected from redeposited pieces of fired clay.

Dispersion of the remanent magnetic directions in the individually oriented specimens collected from a baked feature is indicated by the parameter alpha-95. This parameter is the half angle of the cone for which there is a 95% chance that the true average direction lies within it. Good samples (generally collected from well baked material which has not moved since the time of firing) usually have alpha-95 values less than four degrees. Normally, the results from samples with greater dispersion are not useful in determining a date. The alpha-95 value of 28.1 degrees for the archeomagnetic sample collected at the Cedar Grove site indicates that reliable results cannot be obtained.

Subsequent to measuring the sample, I learned that when Schambach excavated Feature 18, he considered the possibility that the specimens had been collected from fired daub fragments. The following quote from his field notes explains the situation:

> All thermal alteration of soils was directly below and around the zone of daub in the upper level of the feature. In my opinion, the daub itself was the heat source. It looks like this was a large roasting pit in which large, thick slabs of daub (perhaps made for this purpose) were heated elsewhere and then placed in the pit in a variation of hot rock cooking. The abundant fragments of carbonized cane may have been from cane mats used to cover the food and the hot slabs of daub. There were absolutely no traces of ash and little charcoal which would tend to indicate that no fires were ever built directly in this pit. The thermal reddening was pronounced, to depths of 10 cm or more suggesting long and repeated usage. I do not think this effect could have been obtained with a single fire or a single application of hot daub. The position of the daub slabs in the south end of the pit suggests that they are lying where they were raked back off the food after the pit was used for the last time.

While occasionally fired daub may be sufficiently hot when deposited to allow a good archeomagnetic date to be obtained, I would think that this is highly unlikely to happen.

CONCLUDING REMARKS

The precision of chronometric results can usually be quantified. However, the accuracy of such data, which involves an assessment of their "truth" is much more difficult to evaluate. Consistency of several results obtained from a single method and their consistency with the archeological record are often suggestive of accuracy. However these criteria are not sufficient to claim that it has been achieved. Since a great variety of systematic errors can affect the accuracy of most chronometric determinations the best that one can hope for is concordant results from two (or more) independent dating methods.

The situation at Cedar Grove was even more difficult since accurate dating of archeological material younger than 400 years often involves additional problems. Particular problems include secular variation of C-14 and the weak signal often encountered in young TL samples. In addition, a curve depicting the secular variation of geomagnetic direction has yet to be constructed. Consequently, even if excellent results had been obtained on the fired clay sample collected at Cedar Grove, archeomagnetic dating would have had to await the construction of the curve.

Despite these potential difficulties attempts were made to apply archeomagnetic, thermoluminescent, and radiocarbon dating on samples recovered at the Cedar Grove site. Had concordant radiocarbon and thermoluminescent results with good precision been obtained it would have been possible to make some strong statements about the age of the Cedar Grove site. Had a good archeomagnetic result been obtained it could have been compared with the thermoluminescent and radiocarbon results when the secular variation of geomagnetic direction curve for Arkansas for the past 450 years was constructed. Unfortunately, such results were not obtained.

The single archeomagnetic sample was apparently collected from material which had moved since it cooled and therefore the oriented specimens did not carry the direction of the geomagnetic field at the time the material was fired.

It was hoped that it might be possible to utilize the secular variation of C-14 in the atmosphere to assist in dating the samples submitted for radiocarbon determinations. Unfortunately, the precision of these results was very poor. While a the one sigma (67%) level they suggest a date later than A.D. 1650, this not a strong conclusion.

The thermoluminescence results are the most interesting. Traditional thermoluminescent dating has rarely been successful on material less than 1500 years old. However, the use of calcitic shell temper for samples is showing considerable promise in this age range. While caution is certainly warranted when considering results from a new variant of a chronometric method the thermoluminescence dating obtained on the Cedar Grove samples appear to be accurate based on the associated cultural material and they are consistent with site stratigraphy. However, the results were not precise enough to resolve the question of whether the structure at the Cedar Grove site predates or postdates A.D. 1650.

The most significant result of the chronometric studies undertaken on the material recovered at the Cedar Grove site is not the dating of the site but that thermoluminescent dating of calcitic shell temper shows great promise for accurately dating young samples.

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Chapter 18

TERAN-SOULE AND CONTACT ERA MODELS AND CEDAR GROVE: SUMMARY AND CONCLUSIONS

Neal L. Trubowitz

INTRODUCTION

In any *scientific investigation* the researchers should expect that some of their hypotheses will not be supported by the subsequent analyses while others will be proved to *their satisfaction;* this has been the case with the research at Cedar Grove. Detailed analyses have allowed us to refine our understanding of the late Caddo occupation of the Cedar Grove site, and to modify our initial concepts in line with the new information obtained. Based on the original ceramic analysis of the fragmentary pottery recovered in the test excavations (Schambach 1982) the site had been identified as a Caddo V occupation, designated the Chakanina phase. The further analysis of the ceramics recovered in the mitigation stage of research, using a larger sample of midden recovered ceramics, plus the whole vessels from grave contexts, confirmed the basic identification of the site as late Caddo, refining the ceramic chronology to specify that the primary occupation spanned the end of the Caddo IV Belcher phase (1670-1700) into the early Caddo V Chakanina phase (1700-1730). Another *expectation* based on the original contact era dating of the site, that we would find objects of European manufacture within the aboriginal assemblage, was not definitely demonstrated even though there were possible indications of contact. Readers of this study are invited to examine for themselves the different results reported by the various specialists in comparison to the original research goals for the different topics stated in Chapter 2. In this chapter the Great Bend Contact Era and the overall Teran-Soule models will be compared against the body of data recovered at Cedar Grove to determine how well they fit the original models. A final summary is then presented.

THE GREAT BEND CONTACT ERA MODEL

Direct Evidence of Contact

On the face of the data recovered at *Cedar Grove, it* is not possible to provide conclusive artifactual evidence of European contact with the aboriginal occupants. The excavation strategy utilized *would have located introduced* European artifacts if they were present in the midden and feature samples (notably aboriginal burials) that were excavated. The *flotation and fine screen* techniques utilized were designed to recover materials as small as seed beads, as well as the *many* minute carbonized plant parts that were found. Metal detectors were employed specifically to search for metal trade goods. The various analyses looked *for* evidence of contact, in the disease or stress patterns that might have existed in the human osteological remains, the plants and animals that Europeans could have *introduced,* and the pigments used to decorate the ceramics. In the recovery of two bone objects there is a potential identification of a European concept, the button, but again, the artifact is not definitive proof.

While three kinds of chronometric dating were attempted with available samples, only two produced dates of any kind. Weak support for dating Cedar Grove post-A.D. 1650 was obtained from the radiocarbon method. Somewhat stronger *but still* not preponderant evidence for a late seventeenth to early eighteenth century occupation was supported by thermoluminescence.

One line of evidence, however, which we contend sets the Cedar Grove aboriginal occupation within a historic context, is the detailed assessment of ceramics by Schambach and Miller. Comparison to ceramics at other dated Caddoan sites with evidence of European trade goods in association with ceramic wares similar to some at Cedar Grove, places the occupation of Cedar Grove between A.D. 1650 and 1750 at the broadest possible interpretation, and within the more *refined* (and *we believe defensible) limits* of 1670 to 1730. To place the Cedar Grove site any earlier or later in time would put the body of Caddoan ceramic chronology *in doubt.* There is a preponderance of data to indicate that such an interpretation would not be warranted. Therefore, the primary aboriginal occupation of Cedar Grove (the Caddo IV/V occupation) is within the time frame of increasing European visitation to the Caddoan region.

As noted above, no definite artifactual evidence of European manufactured goods was found at the Cedar Grove site. However, after review of the historic literature and some population estimates, the site fits well into the contact era model. This model proposed that there *would* be only limited evidence of European goods on Arkansas Great Bend Kadohadacho sites except possibly in grave contexts of the elite members *of society.* Both Schambach and Miller and Kay have provided convincing evidence, with ceramics and conch shell grave goods respectively, that there is status *ranking evident among* the aboriginal interments at the site.

Kay noted the presence of conch shell grave goods, materials exotic to the Great Bend region and definite status markers during the Belcher phase in Louisiana, among the Group C graves (Figure 10-1). In the ceramic analysis Schambach and Miller produced another grouping of the burials based on ceramics, which complements the other two studies. *The* ceramic seriation basically confirms the original definition of the burial groups and provides an indication of some time change within the Cedar Grove site. Ceramic Groups 1 and 2 are the same as locational Burial Groups A, D, and E, representing the Belcher phase occupation from *1670-1700. Ceramic* Group *3* is equivalent to Burial Groups B and C, which represent the Chakanina phase from 1700-1730. The Chakanina phase group was the one *in which all the high status marine* shell artifacts were interred, further placing it apart from the other grave groups. Analysis of the faunal material by Styles and *Purdue also supports* the assignment of high status to Ceramic Group 3, as the nonhuman interment Burial 2 was an almost complete bald eagle skeleton. The eagle was an animal of significant religious importance and possession of eagle feathers, let alone an entire bird, was probably of

great social significance to the Caddo. Unfortunately, the ethnohistoric record is mute regarding specific Caddoan perceptions and use of the bald eagle. The eagle is known to have had symbolic value to Southeastern Indians in general and its tail feathers were required for some rituals (Hudson 1976:163).

The association of ceramic types in Aboriginal Burials 1 and 2 by Schambach and Miller in their seriation, and the fact that one vessel was a bird effigy are convincing data that the human child and adult eagle in Burials 1 and 2 were interred together and probably on the same occasion. Also in Ceramic Group 3, a bald eagle humerus fragment was interred with Burial 3 showing additional association with this status/religious, or possibly totem animal for the group. Except for the eastern gray squirrel in Burial 8 which could represent a totem animal or pet, the other fish and animal remains in graves appear to be food or tool offerings.

Indirect Evidence: Bone Buttons

The association of high status with Ceramic Group 3 or Burial Group C, and its ceramic dating to the Chakanina phase between 1700-1730 reopens the discussion of the two bone objects found in the grave of the senior adult male, Burial 9. Initially, I explained these two circular bone objects with drilled holes (Figure 13-18) as buttons. The concept of buttons may have been received from Europeans. Kay (this volume) disputed this identification as tenuous and pointed out that the manufacture of such objects was within the technological capabilities of the inhabitants of Cedar Grove and earlier prehistoric Indian occupants of Arkansas, as evidenced by similar bone discs recovered at the Toltec site (3LN42) in the Arkansas River Valley. Since Kay was correct in his identification of the technological potential, further assessment was needed.

Bone Discs From Archeological Sites

I examined a photograph of four of the Toltec specimens (Figure 18-1) and obtained information on two others (courtesy of Mike Kaczor, Arkansas Archeological Survey). The four illustrated specimens were in an exhibit case at Toltec Mounds State Park and could not be removed for direct measurement with convenience, so thickness could not be even indirectly observed from the photograph. However, comparison of Figures 18-1, 13-18, and Table 18-1 make it clear that the Cedar Grove and Toltec specimens, while technologically similar in being drilled round discs, otherwise vary in the overall diameter of the specimens, the placement of holes, and the diameter of the holes. The Cedar Grove discs are smaller in diameter (except for one specimen from Toltec, 77-1144-170, which closely resembles the shell beads found in the necklace on Burial 3 at Cedar Grove) and the diameter of the holes are also smaller. The multiple drilled specimens from Toltec resemble the patterns on a shell gorget from Belcher (Webb 1959:Figure 135), though the latter is much larger of the two with an overall diameter of 9.4 cm. The specimens from Cedar Grove and Toltec have some key differences when the details of their form are examined.

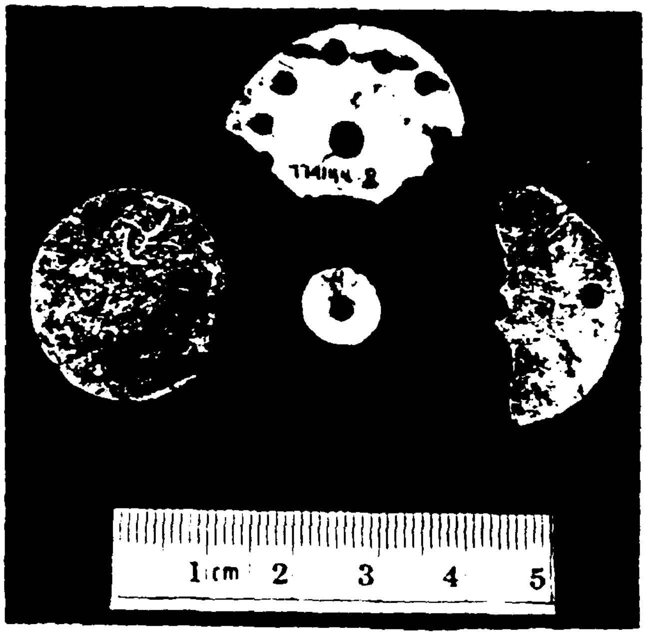

Figure 18-1. Examples of bone discs from Toltec Mounds, 3LN42 (AAS Negative Number 805684)

Reviewing the archeological literature, I could find no specimens equivalent to the two bone discs at Cedar Grove, even in some of the Caddo sites which have had extensive excavations and detailed reporting, such as Belcher (Webb 1959) and George C. Davis (Newell and Krieger 1949). In terms of bone discs, the closest examples found were two undrilled specimens from Burial Pit 2 at Belcher (Webb 1959:Figure 56e-f, Figure 128 j and k), with Skeleton 2, an adult female (Webb 1959:Figure 54). The position of these

Table 18-1. Comparison of bone discs from Cedar Grove, Toltec, and Belcher

Site	Catalog Number	Figure Number*	Diameter (mm)	Thickness (mm)	Perforations Number	Perforations Location	Perforations Diameter (mm)
Cedar Grove	80-1209-1167	13-18a	15.0	1.0	1	central	ca 1.0
Cedar Grove	80-1209-1167	13-18b	16.3	1.0	2	central	1.0
Toltec	77-1144-8	18-1	27.0	-	1	central	3.5
					multiple	on rim	2.4-2.5
Toltec	77-1144-170	18-1	9.0		1	central	2.5
Toltec	77-1144-378	18-1	22.0		none		
Toltec	77-1144-229	18-1	28.0		1	central	3.0
					1 or 2	rim	2.5
Toltec	78-580-49-33			.9	fragment?		
Toltec	78-580-83-2			.6	multiple	on rim	
Belcher	319	56e,128j	29.0		none		
Belcher	320	56f,128k	29.0		none		

*Cedar Grove and Toltec illustration in this report; Belcher in Webb (1959)

bone discs along with two bone pins, six perforated pearl beads, and other artifacts suggested to Webb some kind of hair or head ornaments. The discs were not meant as ear decorations (such as the marine shell discs on Burial 4 at Cedar Grove, Figure 13-20a-b), as Skeleton 2 had a perforated bone ear ornament or labret (Webb 1959:Figure 56h). There were some perforated shell discs at Belcher which were utilized as ear ornaments on Skeleton 1 in Burial Pit 2. These were 1.6 cm in diameter (Webb 1959:173 but were not illustrated). The discs and nine of eleven larger shell discs cut from columella walls (3.2 to 3.8 cm in diameter) were found with Burial 18, laid in a row opposite the lower left leg, indicating some kind of strung arrangement (Webb 1959:Figure 91 and 136).

Other drilled shell or bone artifacts have been reported on other southeastern sites, but they are square or rectangular rather than circular in shape. At the Denham Mound site (3HS15), a Mid-Ouachita Focus site in Hot Spring County, Arkansas, Wood (1963) reported that:

> Three button-like bone objects, 202 fresh-water pearl beads, and 136 conch shell beads and pendants were found together in a large, plain, shell-tempered vessel (Figure 7e). The three bone items are 19 to 20 mm square, and 1 mm or less in thickness; they are pierced by two small, centrally-located holes (Figure 11j). To judge from the many tiny fragments of thin bone in the fill of this vessel, there were originally far more than three such objects (Wood 1963:27).

All these objects were probably ornaments strung into a string(s) for decorative purposes.

The other rectangular objects are defined by Williams (1980) as special horizon traits of the Armorel phase, the latest aboriginal culture unit (1500-1700) in the Mississippi Valley between the present day river border of Arkansas and Tennessee (Williams 1980:Figure 1). These consist of rectangular shell plaques engraved with diagonal lines across the corners, forming a triangular subdivision at each corner with a slight gap usually cut where the diagonal lines intersect (Williams 1980:Figure 2h). They have two holes drilled in the remnant diamond shaped central body of the shell piece. These artifacts were reported at a number of sites in Alabama, Mississippi, Tennessee, and Arkansas, including the Parkin site. Previously, these artifacts have been explained (Knoblock 1939:396) as "shell gorgets designed to symbolize the number four." One specimen illustrated by Knoblock (1939:Plate 184) had more rounded corners and deeper separations between the corners than the more rectangular ones illustrated by Williams. Williams noted that they clustered in distribution in the Mississippi Valley and nearby areas in the Southeast, contrasting with changes in form of somewhat similar buttons found in Fort Ancient sites to the north like Fox Farm (Williams 1980:109). However, on his terminology he noted:

> The term button is not used here to denote implied function, but to set these button-like pierced and engraved shell artifacts apart from other beads, etc. (Williams 1980:109, Footnote 2).

Most of these examples of "button-like" objects, both round and rectangular or square, appear to be ornaments of some kind rather than buttons in function. At the C. V. Campbell (23PM5) site in southeast Missouri three out of four of these buttonlike objects (Klinger 1977:Figure 3a-c) were found around the neck of a child of six to eight years.

> Although their archeological context suggests that these artifacts did not function as buttons but rather as beads or pendants, a review of the literature clearly indicates that they could have served equally well in both functional roles. Essentially square, the most complete of these measures 24 mm long and 23 mm wide. One face of each button has four engraved lines outlining the shape of a diamond. One small partially drilled hole (in fact a dot) is located in each of the four corners in addition to two central perforations (3 mm in diameter) similar to the European type (Klinger 1977:96).

Thus, while the association of these shell rectangular objects with early contact era sites appears good, their function is still in question. Nonetheless, their known distribution is entirely outside the Caddoan area.

We are still left with the impression that circular bone objects similar to those found at Cedar Grove have not been recovered elsewhere in the Caddoan area. While it is true that they were found in the grave fill flotation matrix rather than in situ in Burial 9, it is possible to eliminate with some certainty their having been ornaments that were worn around the neck, on the ears, or on the wrist. The crew excavating Burial 9 was aware of these loci as potential areas containing exotic marine shell artifacts and excavations in those parts of the burials were particularly careful to look for such goods. In fact Burial 9 did have conch shell ear pendants (Figure 13-23), eliminating that position from having yielded the bone discs. It is possible that the two bone discs came from some part of the interment where grave goods had not been noted in the other grave excavations, and hence were missed until the flotation matrix was processed, but their small size and light color may simply have been invisible against the clean sand of the grave fill and surrounding subsoil. There is no question that these objects came from an undisturbed aboriginal grave protected beneath the overburden of the central portion of the historic levee.

Based on ceramic seriation of the grave lots, Schambach and Miller placed Burial 9 in the Chakanina phase occupation (1700-1730) as one of the three latest graves. In terms of the occupation of the Cedar Grove locus, this is the time period corresponding with the beginning of more regular contacts with Europeans in the Great Bend region, yielding more European products (although still in limited quantities). As Burial 9 is the senior male in the high status burial group, it is among those having the highest potential, if not the single greatest potential, of having European products as grave goods.

European Trade or Gifts as a Source of Buttons

We have clear accounts (Chapter 5) of the Ramon expedition in 1716 and Aguayo expedition in 1721 giving away finished clothing to the Indians, including in the latter case two Kadohadacho captains and their 80 followers, who received additional clothing to take back to their homes to distribute. Higher status individuals were receiving a finer grade of finished clothing from the Spanish. It is therefore suggested that the two buttonlike objects found with Burial 9 could be European buttons from a piece of clothing obtained as a gift from the 1721 Aguayo expedition or other European sources.

Seventeenth and eighteenth century European male clothing that had buttons normally had more than just two. Shirts with button commonly had one or two at the neck and one each on the cuffs or a pair of cufflinks (each a set of linked buttons). Breeches and trousers had at least three in the front on the fall, usually more, and often had three or more buttons on each leg of the breeches to close them at the knee. Waistcoats and overcoats had numerous buttons.

It should be noted that buttons are not necessarily associated with clothing. There is one item of European accouterment that would have been carried by almost any trader, soldier, explorer or missionary; this is the food haversack. This was a simple cloth bag, usually made of linen, with a strap attached for hanging. The haversack was commonly worn over the right shoulder, hanging to the

left side. This bag was used to carry rations and it was closed with two or three buttons, which could be made of metal, bone, or antler. All soldiers were issued these bags, or made them for themselves, and Europeans would have taken them everywhere during their early travels in the Southeast. Such a bag would have been immediately apparent as a useful item to the Indians of the Southeast.

In contrast to European clothing, ethnohistoric accounts of aboriginal Caddoan garments portray them as buttonless, with men wearing deerskin breechclouts in the summer, adding pullover leather shirts, leggings, and moccasins in colder weather, while the women wore grass or hay breechclouts under outer clothes consisting

> of two gamuzas (meaning evidently 'deerskins'): one covers them from the waist to the ankle; and the other with an opening in the center, through which they stick the head (Swanton 1942:141).

Penicaut in the winter of 1706-1707 stayed among the Natchitoches and mentions that skirts made of cloth woven from nettles were worn by the chief's daughters, but this the only such reference despite the common use of such material or mulberry bark for women's garments in the Southeast (Swanton 1942:141). Buttons do not appear to be used as clothing fasteners according to the ethnohistoric records, and the concept would appear to be one of European origin among the Caddo.

Of course it is not possible at present to prove this assertion or the Aguayo clothing suggestion, but the circumstantial evidence regarding the bone objects in Burial 9 make the "best" explanation the hypothesis that they are European buttons at least in concept if not in actual origin. The buttonlike objects came from the grave of the person most likely to have European goods, at the time that European goods were most likely to appear on the site. They are of a size and shape similar to buttons of European manufacture from this time period, are unique in the Caddoan archeological record insofar as they have not been found on precontact era sites, and they were not found in an ornamental context like the other decorative objects recovered in the Cedar Grove burials.

Whether the bone discs were made by Europeans or Indians, the concept appears to be of European origin. I stand by my earlier suggested explanation that these objects are in all probability functioning buttons, and evidence of European contact at Cedar Grove.

The Cedar Grove Contact Era Model in Retrospect

In conclusion, the Cedar Grove site data agree with the diachronic Cedar Grove Contact Era model constructed for the Arkansas Great Bend region, of there being limited amounts of European products available before 1730. Those goods that did reach the area were most likely acquired and controlled by the higher ranking members of the local society until later in the eighteenth century when European goods became more common and European diseases began to significantly reduce the Kadohadacho population. The total assemblage of data at Cedar Grove represents an aboriginal group that has not become dependent on European technology or a trade economy with Europeans. Using a definition of acculturation as a common process of culture change (Brain 1979:270), the Cedar Grove inhabitants had not become acculturated by European contacts, and the basic fabric of Caddoan culture was intact. Only some minor technological innovations (i.e., the button) had possibly been adopted without affecting everyday lifeways for the bulk of the population. Apparently, the European impact on native lifeways among the Arkansas Great Bend Kadohadacho was delayed longer than among the other Caddoan groups due to the relative isolation of these Kadohadacho in the heartland of the Red River Caddoan region. Cedar Grove is probably typical of other farmsteads in the Spirit Lake locality in that few European goods can be expected to be recoverable on loci dating from 1500-1730, although some mound related interments could produce some nonperishable European items.

THE TERAN-SOULE MODEL

Spatial Arrangement

The earlier half of the Teran-Soule model was based on the Teran map of 1691 (Figure 2-1), which was used by Schambach to build the basic model of both typical and high status residences in the Red River Valley at the end of the seventeenth century. We also have Teran's description of the Caddoan settlements he encountered in Bowie County, Texas on November 28, 1691:

> we traveled five and one half leagues in the same direction until at last we reached a level tract. It was less than a league straight through, in a northerly direction, or six leagues around the edge. The Indian guides informed me that at long intervals it was covered by the waters from the river in the territory occupied by the tribe. We crossed this level space, still going in the same direction, passed two lakes and came to a grove of trees. From this point we caught sight of one of the rancherias of the nation. It was located on a hill, which commanded the whole country. As soon as I arrived, I had the place examined as a precaution against an ambush, in case the French might be in the country and attempt to surprise us. After reconnoitering it, the Indian guide informed us through Brother Antonio, who served as an interpreter, that this was the temple in which the Indians worshiped and made offerings to their gods. We proceeded from this place and we made camp at the home of an Indian whom they called Caddi, located about half a league, more or less from the temple or mezquita (Hatcher 1932:32-33).

Here is a clear description identifying the temple mound shown on the west end of the Teran map (Figure 2-1). A few days later Teran completed his narrative of the scattered settlements (see also Appendix IV):

> I will state also that in company with the alferez, the pilots, the caddi and the companions of the Reverend Father Commissary, I went to the opposite bank of the river to examine the settled region. I found it the same as on this side. Through the caddi, as an interpreter I learned from the native Indians that the settlements extended down stream along the river bank (Hatcher 1932:35).

The year before Teran reached the Red River, Tonty had provided a description of the dispersed settlements, possibly of the same ones visited by Teran:

> The Cadodoquis are united with two other villages called Natchitoches and Nasoui (Nasoni) situated on the Red River. All the nations of this tribe speak the same language. Their cabins are covered with straw, and they are not united in villages, but their huts are distant one from the other. Their fields are beautiful. They fish and hunt. There is plenty of game, but few cattle (boeufs) (Swanton 1942:43).

The dispersed settlement system of the Red River Caddo has been both described and drawn, providing a firm basis for modeling what might be found in the archeological record. To this document was added the Soule photographs (Figures 2-2 and 2-3) which show that the internal Caddoan farmstead settlement pattern illustrated by Teran persisted

into the nineteenth century, a strong foundation for a diachronic model. The bulk of discussion that follows will apply the Cedar Grove data against the salient research questions outlined from the Teran and Soule documents.

The basic Caddo farmstead was documented as consisting of an area containing from one to three houses, up to two storage platforms, and sometimes a ramada. At Cedar Grove we have positive evidence for at least one Caddo structure, Structure 1 (Feature 3), and probably two others, Structures 2 and 3 (Features 24 and 25).

Schambach postulated that the compound of the Caddi would be the only one with more than a single ramada or brush arbor. Other historic documents describe special accommodations made for those who visited the Caddi for ceremonial and social functions. Father Massanet described in 1690 the special structures associated with the house of a Hasinai Caddo functionary:

> Soon I noticed, outside the yard, opposite the door of the governor's house, another long building, in which no inmates could be seen. I asked who dwelt therein or what purpose it served, and was told that the captains were lodged in that house when the governor called them to a meeting. On the other side I saw yet another and smaller vacant house, and upon my inquiring about this one they answered that in the smaller house the pages of the captains were lodged, for there is a law providing that each captain shall bring his page when the governor assembles the captains, and they observe this custom (Swanton 1942:149).

With only one relatively complete house outline at Cedar Grove we cannot rule out such structures having been in the vicinity. If present they would have been to the east of the line of structures located on the higher part of the point bar as the west side of the site sloped off into a water filled swale. The limited hand cleaning of the stripped midden area to the east of North-South Trench 2 in the vicinity of test square S72 E212 yielded no evidence of any postmold pattern in that area, which had been cultivated sometime after the aboriginal occupation. Such structures might also have been to the north of the known site area, which was destroyed by Red River meandering, or else to the south in the unexcavated area between Caddo Structure 1 and the direct impact zone, or even farther south outside the project right-of-way.

Evidence was found at Cedar Grove of p[illegible] two ramadas, Cluster 2 and Cluster 3, but no ex[illegible]es of the postmold pattern expected for a storage structure were identified. Part of this problem in identification was linked to the large numbers of historic features which intruded the aboriginal occupation, making it difficult to trace postmold lines. Given the extensiveness of the historic land use, it was fortuitous that we were able to identify as many aboriginal features as we did.

We were unable to completely define the limits of the compound at Cedar Grove due to both the destruction caused by river meandering and revetment construction of portions of the site, and restriction of research within the right-of-way limits; it was highly beneficial that we were able to carry out some limited excavations in the indirect impact zone. These efforts defined the one recognizable Caddo structure we found, permitting interpretation of the more fragmented archeological record in the direct impact zone. Historic disturbances made it difficult to determine whether any ephemeral features such as Caddoan cropmarks and paths were on the site. Rebuilding did not appear to have been carried out at Cedar Grove as the structure locations and adult burial groups we were able to define appeared to be spatially distinct.

Status Indications

Storage Structures. The historic disturbances pose a problem in interpreting whether Cedar Grove was the farmstead of simple farmers, the compound of a higher status family, or both. As part of the model it was presumed that the compound of the Caddi did not have a storage platform because much of his food needs and that of his immediate family were supplied by the general population. The Caddi's compound on the Teran map did not have a storage structure, and therefore other higher status compounds might be expected to not have them represented archeologically. We cannot shed any light on this question at Cedar Grove from the perspective of survival of aboriginal features. It is also possible that some compounds did not have separate storage structures due to using the "attics" of the houses for food preservation. An Upper Nasoni compound described by Joutel in 1687 had both house storage and use of some kind of separate drying structure:

> The cabins of these savages are made like those of the Cenis (Hasinai), of which I have spoken already, except that they are not so lofty; there is a large platform above the door made of pieces of wood planted upright with others across them, and rows of canes pressed very closely together, on which they put their ears of corn. There is another opposite on which they place tuns or casks which they make of canes and bark, in which they put their shelled corn, beans, and nuts, acorns, and other things, and under that they put their pots. Each family has its own tuns; they have their beds to right and left, and of the kind I have already described. These Indians have besides a big platform in front of their cabins which is raised from ten to twelve feet, on which they put their ears of corn to dry, after they have gathered them, and which they take care to sweep every day (Swanton 1942:148).

The patterns of postmolds in Clusters 2 and 3 at Cedar Grove most likely represent drying rack/work platform ramadas such as those described by Joutel or depicted in the Soule photographs.

Artifact Indicators. The Teran-Soule model also specified the presence or absence of various debris and artifact assemblages as possible indicators of high or low status compounds. Pipes were postulated to be markers of religious or ceremonial activity and were not presumed to be found on everyday farmsteads. At Cedar Grove the only evidence of smoking paraphernalia was the whole pipe (Figure 9-25 and Figure 11-39) found in Burial 14, which otherwise had no high status grave goods, i.e. marine shell artifacts (Figure 9-14). No pipe fragments were found in the midden.

The model predicted that normal farmsteads would have a high incidence of whole and broken celts. The recovery of two complete diorite celts, two complete chert cobble celts, and one chert cobble celt bit fragment (Figure 13-14a-e) might be seen as support for the model, but compared to the total debitage there were few celts. In terms of the total tool assemblage Kay concluded that "the majority of stone and bone tools from Cedar Grove is unambiguously classed as utilitarian, or technomic artifacts which have clear extractive or maintenance functions." It appears that the site was used in everyday activities, but there were few activities requiring celts.

Food Refuse. On a higher status compound an unusually limited range of food refuse (namely faunal material) was expected. The Cedar Grove assemblage provides ambiguous evidence to answer this suggestion from the model. Though there was a diversity of animal species represented when the site was considered as a whole, Styles and Purdue concluded that the emphasis was primarily on

white tailed deer and turkey. While fish remains from many different species were ubiquitous on the site, the concentration on gar and bowfin was unexpected given the accessibility of aquatic resources. Among plant remains maize was widespread on the site, but only in small amounts. Nuts did not appear in large quantities, nor did other cultigens and wild plant foods. The problem with interpreting these remains derives from several possible sources of error, including the potential that food processing methods were not conducive to archeological preservation, the site sampling size and methodology employed could have missed key data, that some plant and animal remains may not represent resources used as food, and a general lack of comparative data gathered through similar controlled excavations to use as a standard of typical Caddoan diet during this time period. The Kadohadacho at Cedar Grove had a varied and well balanced diet as shown in both the actual plant and animal remains and the health of the skeletal population. Nonetheless, we cannot presently specify whether the possible preference for deer, turkey, and maize is real, let alone a matter of differential access due to social status.

A number of plants and animals mentioned frequently in the ethnohistoric records as Caddo foodstuffs, particularly beans and buffalo, are not represented as archeological remains or are present only in minor amounts. The recovery of a single buffalo toe in an undisturbed context at Cedar Grove is in fact the first time that we know of actual bison remains being found on a Caddoan site (Schambach, personal communication), despite accounts of their hunting the animals and using the hides for clothing and blankets (Swanton 1942). It is evident that some cultural behavior factors and/or preservation conditions are biasing the archeological record.

On the other hand, deer antler was common refuse at Cedar Grove, along with finished antler tip projectile points and other antler tip tool fragments. Since antler was found both in midden and as grave goods, there does not appear to be any specialized treatment of deer antler, such as was found at Crenshaw, a Great Bend Caddo occupation dating between A.D. 1000-1100. Hence, there was no evidence of deer ceremonialism at Cedar Grove.

Ceramics. The final category of artifacts in the Teran-Soule model which might indicate a high status residence was ceramics. On normal farmsteads the model expected a high percentage of very large utility vessels, which would be two to three times the size of utility vessels found in graves. Schambach and Miller did not specifically address this point, but it is noted that the ethnohistoric records describe the storage of foodstuffs in containers of cane and bark (as described by Joutel) which would not survive in the archeological record. Massanet in 1690 noted that it was the custom of the Caddo leaders to feed their headmen and assistants when called into conference for the entire period of the meeting. Continuing with the discussion quoted above, he outlined the provisions for feeding the retainers of the chief:

> *In the other half of the house where there are no beds, there are some shelves about two varas (5.56 feet) high, and on them are ranged large round baskets made of reeds (in which they keep their corn, nuts, acorns, beans, etc.), a row of very large earthen pots like our earthen jars, these pots being used only to make the atole when there is a large crowd on the occasion of some ceremony, and six wooden mortars for pounding the corn in rainy weather, (for, when it is fair, they pound it in the courtyard) (Swanton 1942:149).*

It therefore is concluded that large utility vessels should not be expected to only be diagnostic of average Caddo compounds.

The model notes that fine ware pottery types should occur in low proportions on such sites. The presence of high percentages of such pottery was to be a marker of a high status compound. The high figures from Cedar Grove of 54.7% of the sortable sherd collection being fine wares, along with over half of the whole vessel collection, are proof of the uniqueness of Cedar Grove. However, Schambach and Miller have reconsidered the original hypothesis because of the possible relationship of Cedar Grove to all the mounds and mound groups in the Spirit Lake locality; they have suggested that we must question whether the Cedar Grove site lies within the ceremonial precincts of the paramount Caddo ceremonial center at Battle Mound or Egypt Mound (Figure 1-7), so it may be the case that the inhabitants of the Cedar Grove site were a paramount lineage rather than average farmers.

Burial Groupings. As discussed, status differential was evident at Cedar Grove between the individuals in Burial Group C who had exotic marine shell goods, and those interred in Burial Groups A, D, and E. There is a complication in that the higher status group also is seriated later than the other burials, raising the possibility that over time there was greater access to exotic goods among the inhabitants of Cedar Grove, rather than there being two different status groups. The ceramic pipe found in Burial Group E may have been an earlier status marker.

Assuming that the Group B and C burials (Ceramic Group 3) do represent a higher status family, the question again is where do they fit in Caddo society? Wyckoff and Baugh (1980) have proposed archeological models for Hasinai elites based on historic documentation for the period under consideration for Cedar Grove, which will be used here. It should be noted that though historic accounts mention the basic similarity of the Hasinai and Kadohadacho confederacies, some variation might be expected between the groups. Their model shows that the domiciles of the highest Caddo officials, the Xinesi and Caddi, should be expected to be larger than the typical Caddo house, some 18.3 m in diameter. The one measurable structure at Cedar Grove was only 9.6 m in diameter, probably too small for high officials. It may be possible larger structures are present on the site but unrecognized due to historic disturbance or burial by recent alluvium.

Evidence For Intermediate Status

Review of the spatial, mortuary, and artifact data from Cedar Grove to determine if it is indeed a Caddoan elite compound has produced ambiguous results. The lack of any clear distinctive pattern may indicate an intermediate position, suggesting that Cedar Grove was the residence of a lesser group of Caddo functionaries, possibly the family of a canaha (an elder or captain) or their subordinates, the chaya, or the Caddi's subordinates, the tammas. Another position among the nongoverning elite was the conna or shaman (Wyckoff and Baugh 1980:237). Any of these intermediate status positions would have had a combination of higher status as well as common goods, possibly such as represented at Cedar Grove; status marine shell goods are present, along with a wide range of utilitarian tools. Fine ware ceramics are common, and were used in everyday contexts, as evidenced by soot deposits and recycling of broken pots before they were used as grave goods. The young male in Burial 7, in the high status Group C plot, had nothing but recycled pots.

Schambach and Miller offered various explanations for this situation. We can rule out that Burial 7 was a slave or servant because he had marine shell status goods, and the demography of the burial plot indicates that he was a member of the family group represented by the Group B and C burials. Recycling evidence was restricted to the Group B and C burials, and at least one vessel in each grave lot was used. This family apparently did not have the means to provide themselves with all brand new grave goods. Schambach and Miller favored an explanation for these battered fine ware ceramics as resulting from demographic stress among the Caddo around A.D. [illegible] to European diseases, which caused a shortage [illegible] and their wares. However, the multiple [illegible]

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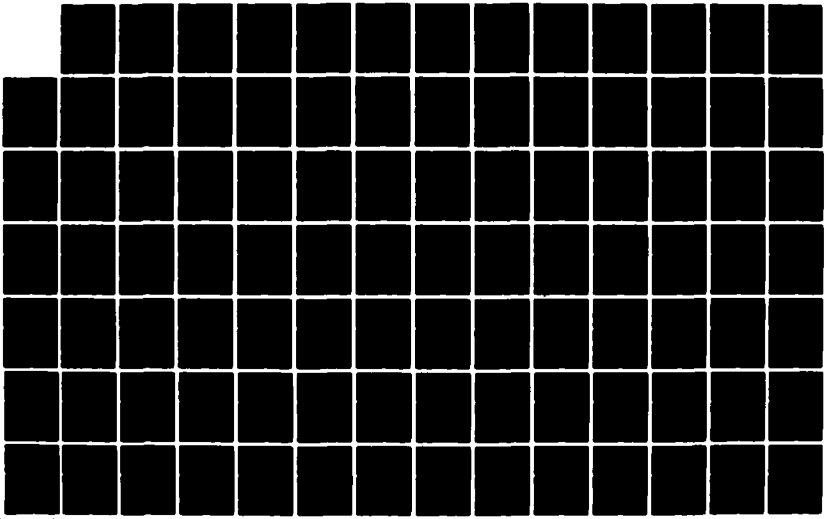

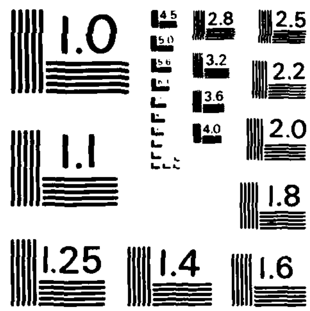

MICROCOPY RESOLUTION TEST CHART
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derived from the various specialized analyses appear to favor other explanations. The Cedar Grove burials have the demography of a normal family cemetery and of a population with a well balanced diet. No evidence of European disease inroads was found, and the basic aboriginal lifeway was intact. It is difficult to compare professionally excavated recycled pots from the late Caddo component at Cedar Grove against the culls of pothunters and make any judgments about how common the recycling of pots was during this time period. Since Cedar Grove is the first site of the era to have been professionally excavated in the Arkansas Great Bend region, it is the standard against which future excavations will be measured; until more such excavations are completed the recycling question remains unanswered.

However, it is possible that the observed recycling pattern might be expected among the nongoverning elite as other aspects of Cedar Grove fit a number of the conditions drawn up by Wyckoff and Baugh (1980:282) for the material remains expected on a canahas' residence compound. These include residences "indistinguishable on the basis of size" (as shown above), "east entryways" (probable at Cedar Grove due to the ramadas being just east of the Caddo structures), and "central hearths" (Feature 18 may have functioned as such in Caddo Structure 1). Cedar Grove does not have enough area excavated to determine whether there was a concentration of small interior postmolds (representing bed posts) on one side of the structure. According to the model it would be expected that the midden contains fragmentary artifacts indicating average daily activities, such was the case at Cedar Grove. At Cedar Grove the midden was located both inside as well as outside the structures rather than being restricted to the outside as proposed in the model. Ash deposits were also to be expected according to the model but no ash deposits were identified at Cedar Grove. The aboriginal cemetery at Cedar Grove fits the Wyckoff and Baugh model having "spatial clustering of related individuals," but it is not clear what quantity they meant by a "large number of burials." Wyckoff and Baugh suggested that both the residence and grave of the cahana could have artifacts similar to the Caddi's, including European trade items. Only the senior male in the high status group at Cedar Grove had possible European influenced buttons, but if this person is an even lower level functionary, a chaya or tamma, he might have had less access to such goods and we would not expect to find them in any quantity at his compound. The difference between subareas in access to European goods should also affect this.

Burial Patterns

Clearly infants and small children received different burial treatment from adults. They were buried within structures, while juveniles and adults were buried in plots adjacent to houses. Age and sex related differences were apparent in the distribution of grave goods, as well as marking status differences between some of the burial groups. Groupings of skeletal anomalies and nonmetric traits suggested that this population, specifically Burial Group C, represented the dead from a patrilocal family, which is indirectly implied in ethnographic accounts for the Hasinai Caddo between 1691-1722:

> If a man wants a certain woman for his wife who he knows is a maiden, he takes her some of the very best things he has; and if her father and mother given their permission for her to receive the gift, the answer is that they consent to the marriage. But they do not allow him to take her away with him until they have first given notice to the caddi (Swanton 1942:161).

Descriptions of Hasinai Caddo burial customs during this era also closely match the Cedar Grove archeological remains. Father Casanas in 1691 described the burial of a leading man among the Hasinai Caddo which mentions a coffin of some kind, but fails to specify if it was European in style or otherwise. After oration about the deceased

> they carried the dead body outside as fast as they could, shooting a great many arrows into the air. Then they put whatever clothes he had into the grave, placed the body on top of them, and closed the grave. The two men who served as priests talked earnestly and in a low voice, while the others stood round weeping. When all was finished they went home; and the first thing they did was to carry him some thing of the very best things they had, placing it on top of the grave. Then they put some tobacco and some fire there and left a pot full of water. They all went away to eat.
>
> Such ceremonies as I have described are performed when the deceased is one of the chiefs. If he is an ordinary individual, the ceremonies are about the same, only there is not so much pomp (Swanton 1942:207-208).

In 1717 Father Hidalgo described burial customs as follows:

> They bury their dead, after bathing them, interring with them the trophies they have captured with the deer skins they possess, and with all the gifts their relatives supply. They place there something of everything they have to eat as well as buffalo hides. They bury the scalps so that their enemies may go along to serve them in the other life. They place there provisions for the journey and other possessions to serve for clothing (Hatcher 1927:57).

Father Espinosa in 1722 gave a description of burials which is similar at first to that of Father Hidalgo, indicating that the customs were constant over the intervening five years, and/or Espinosa copied Hidalgo:

> They prepare the dead body for burial, after first bathing it, by clothing it in the best clothes they have or in fresh deer skins. With great lamentations, they keep it for several hours in the home. They provide great quantities of pinole, corn, and other eatables. If it be a man, they collect his bows and arrows, his knife, and the other things needed in life and, if it be a woman, all her domestic utensils, canisters, grinding instruments, and earthen-ware vessels, because they say the dead will have need of them where they are going (Hatcher 1927:162).

At Cedar Grove males received sex related offerings in arrowheads (probably originally accompanied by the shaft and feather as well as a bow, but which did not survive archeologically), flintknapping tools, a pipe, pigments, and the conch shell cup in Burial 7. Female related goods included a shell hoe as well as ceramics (women were described as the potters in ethnohistoric accounts). However, pottery vessels were used in all graves, probably as containers for food and water offerings, though samples sent to Harvard University showed no evidence of organic residue (Elizabeth Coughlin, personal communication).

Finally, some questions of the Teran-Soule model cannot be answered on the basis of a single site excavation. We cannot determine at present whether Cedar Grove represents the usual compound of its type, the full range of activities that might be expected on it, whether some craft specializations were practiced, or what the average distance between compounds was.

SUMMARY

The Teran-Soule model has proved itself to be an effective means of approaching the excavation of a late Caddo site. Many parts of the model were found to have archeological counterparts at Cedar Grove, which also supplied data that help refine the model so that we may ask more detailed questions of the archeological record in the future. Beside the Teran-Soule model, two other models based on ethnohistoric records have also proven useful in the analysis of Cedar Grove. One is the Wyckoff and Baugh (1980) model of Hasinai elites, and the other is the Great Bend Contact Era Model. All three of these models provide similar means of interpreting archeological data from diachronic ethnohistoric documents. Much of the success in their use is related to how well we can tie those written accounts to the Caddoan region archeological record. Except for European posts, the direct historic approach has been unable to identify many specific contact era Caddo sites named in documents, but the documentary records are so strong that we can be confident of at least the confederacies' general geographic distributions at specific points in time, and therefore can relate Caddoan archeological sites found in those subareas which date between 1685-1750 to those confederacies.

Cedar Grove was found to fit the Great Bend Contact Era Model, as little evidence of European impact was found on the aboriginal population. They were apparently healthy people following an aboriginal lifeway, unaffected by European diseases, and with little in the way of European technology, if any. An inherited rank social system and age and sex differences guided their daily activities, which included both extractive and maintenance chores. Cedar Grove may have been the residence of a lower level Caddo official and his family and retainers between 1670-1730. Trading brought exotic marine shells for use as status markers for the inhabitants. They had a well balanced diet incorporating a variety of animals they hunted and trapped. They gathered wild plants, raised crops. The wild plants and animals were collected from the diverse floodplain microenvironments surrounding the site, but the food patterns appeared to be focused on deer and maize. Most of the resources they needed, including lithics, were available locally. With no strong evidence to the contrary, and a variety of faunal remains reflecting resources available in every season, it is probable that the site was inhabited year round, despite the occasional danger of flooding.

The Cedar Grove inhabitants lived along the rise of a point bar ridge within the axis of a large stable river meander bend. This rise was probably adequate to keep them safe from most floods, but even in the case of flooding, typical Caddo structures had their food reserves stored well off the ground in separate storage structures or within their houses. At least one, and probably two more, circular houses (Figure 18-2) were oriented along the highest elevation at Cedar Grove. Garbage was thrown into the slough, while daily activities were most likely concentrated around two ramadas east of the houses on the more gradual slope of the point bar, where the crops were probably grown.

Throughout the occupation of Cedar Grove, the Caddo had a consistent settlement pattern of individual houses with associated ramadas and adults buried in adjacent family plots, while subadults were interred inside the structures. Based on the ceramic assemblage, a single continuous occupation is argued for, which is divided into two 30 year periods, the Belcher phase from 1670 to 1700, and the Chakanina phase from 1700 to 1730. The distribution of ceramics associated with the various structures and graves also indicate some internal variations in spatial patterning. Structure 1, its ramada, and associated Burial Group A in the indirect impact zone, and Structure 3 with associated Grave Groups D, E, and F in the direct impact zone appear to be two groups of Belcher phase occupations. Between these two Belcher phase groups of features in the direct impact zone is a Chakanina phase complex consisting of Structure 2, a ramada, and associated Burial Groups B and C (Figure 18-2).

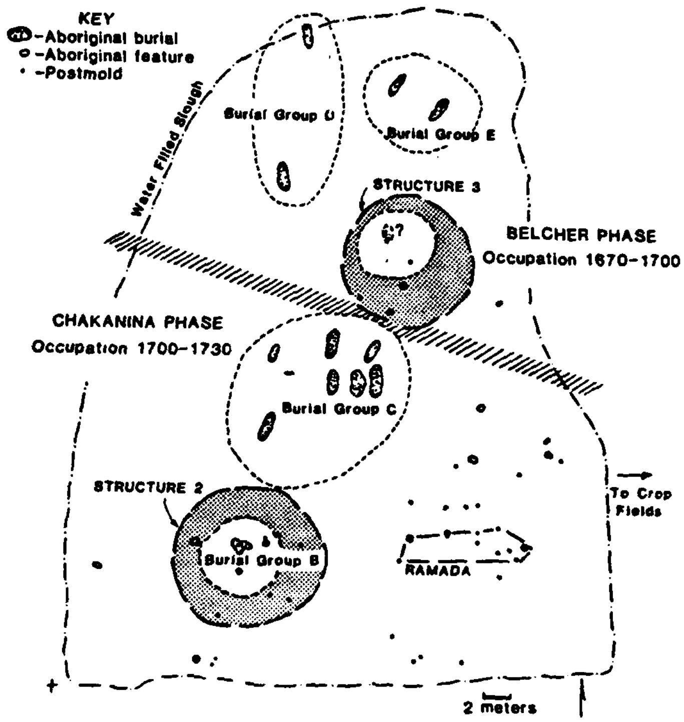

Figure 18-2. Settlement pattern interpretation in the direct impact zone

The Chakanina phase complex is associated with high status markers including imported conch shell beads, pendants, a cup, and bald eagle grave offerings. Support for the Chakanina complex being in part sequential to, rather than contemporary with, the Belcher complex derives from this variation in status markers. The ethnohistoric records indicate that the living quarters of higher status Caddo personages were separate from those of the bulk of the population. Therefore, we should not find two different status families living immediately adjacent to each other.

An alternative explanation is that the residents of Cedar Grove acquired more access to status goods over time. Using the Great Bend Contact Era Model, we predict that as the upper class of the Kadohadacho in the Great Bend obtained European trade goods, these new items replaced the older conch shell objects as status markers, making the latter available to the broader population as hand-me-downs. Only one of the Belcher phase burials, number 16 inside Structure 3, had a few small conch shell beads similar to those found on Burial 3; this Belcher phase burial is closest physically to the Chakanina graves, and could represent the continuum of growing access to conch shell goods acquired by the Cedar Grove inhabitants over time. The first Belcher phase burials had no conch shell goods; an intermediate grave received a few, and then all the Chakanina phase interments were given conch shell or other "old fashion" status markers.

We know that some archeologists do not presently accept the ceramic seriation of Cedar Grove as postdating 1700, largely on the basis of the absence of identifiable European trade goods. They would place the Cedar Grove occupation into the period form 1650 to 1700. However, changing the outer limits of the time of occupation does

not alter the clear pattern of seriated ceramic assemblages within the individual grave lots, or the strength of the interpretations of internal settlement patterning based on those assemblages and associated data.

Ceremonial centers with mounds were near Cedar Grove within easy walking distance or paddling in a dugout canoe. These mounds were located on abandoned river oxbows where there was less danger of erosion. The Cedar Grove occupants had chosen their home well, as the bend of the river within which the site was situated has been one of the most stable along the Red River's course through Arkansas. That they had little problem with flooding is shown by the surface of their occupation remaining unaffected by flood deposits through later historic occupation for nearly 200 years after the Indians abandoned the site. The Caddo had adapted closely to their local environment, without the need to modify the natural pattern of floodplain meandering.

In contrast, historic land use at the site focused first on protection of floodplain crops through the erection of levees on top of natural rises. Little success was garnered in protecting the crops until the federal government began the revetment construction that led to the discovery of the Cedar Grove site. No home sites were at Cedar Grove historically (in the area excavated), although it was used as a cemetery by former slaves and the descendants of slaves who established the Cedar Grove Church in the late 1800s. Tenant farms were scattered among the larger land holdings with local town mercantiles providing goods that could not be produced on the farms.

While it might be argued that homesteads are still dispersed along the margins of the Red River floodplain, the greatest population densities have shifted historically to towns and villages in the area, such as Lewisville and Garland City. Modern communities have sought to stabilize the course of the Red River and prevent its flood and erosion damages. The Caddo lived closer to the river course and probably in greater floodplain population densities, even though a single village consisting of many farmsteads was distributed for kilometers along the river course. Modern technology, of course, is largely responsible for the change in farming methods and the greater amount of acreage that can be made productive by a single worker today; this along with improved transportation networks has assisted in the thinning out of floodplain homesteads.

CONCLUSION

The investigations at Cedar Grove have been exemplary in many respects. They represent the most comprehensive excavations and analyses ever undertaken on a late Caddoan settlement in the Red River Valley in Arkansas. Several ethnohistoric models, including two developed as a result of the Cedar Grove investigations, were effectively used to interpret the archeological record.

While some may not agree with our interpretations or specific details of the models we constructed, it should be kept in mind that a model is only a simulation of reality, rather than a complete depiction of it. Models are valuable as tools in the process of research, and it is to be expected that portions of them will be refuted or modified in the course of continued investigations.

Studies of river morphology, soil samples, and Caddoan land use have implications for modern users of the Red River floodplain, as well as for continuing archeological research on that landform. The comprehensive approach to chronometrics produced favorable results for thermoluminescence, which is still in its developmental stages for dating archeological materials. Other portions of the research considerably refined late Caddoan ceramic seriation, defined new varieties of vessels and other aspects of the Chakanina phase, identified pigments, effectively used a general systems model for subtractive lithic and bone and shell technology to outline manufacturing techniques, and reported plant and animal remains, including bald eagle and bison which have not been reported previously on late Caddoan sites. Bioarcheological study detailed the health and demography of the population, and the adaptive fitness of their diet. This evidence both agreed and contrasted with the results of the botanical, faunal, and radiocarbon isotope studies. The research showed that some assumptions archeologists have maintained regarding the progress and effects of European contact must be reconsidered in terms of a more complex diachronic model related to specific geographical subareas.

The research at Cedar Grove brought to bear interdisciplinary planning, execution of the research, and analyses to produce a breadth of understanding of the recovered data of substantial merit to late Caddoan research. In so doing, it has set new standards of data recovery, analysis, and interpretation.

Other sites like Cedar Grove should still be extant. They need to be found and studied intensively before river meandering and/or human land use or pothunting destroy the slowly deteriorating patterns of data waiting in the ground. Cedar Grove was the first time in Arkansas that a late Caddo site received interdisciplinary investigations rather than the destructive attention of collectors seeking only art objects or profit. We hope that the research carried out at Cedar Grove will be of benefit to professional archeologists, but will also serve as a lesson to those who are not professionally trained, that careless digging destroys more than it preserves. As noted in the acknowledgments, many persons had the opportunity to participate in the Cedar Grove research on a volunteer basis as they were able to find time, making the project a true exercise in public archeology. There are many legitimate avenues for those who wish to have hands on experience in recovering the story of America's past. Those who worked on Cedar Grove can be justly proud of their contribution.

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APPENDIX I
GEOCHEMICAL TESTING CONDUCTED ON SELECTED CEDAR GROVE AND SENTELL SITE SOIL SAMPLES

Michael J. Kaczor

SOIL ANALYSIS GOALS

Within the archeological context, discriminate soil sample testing is generally considered as a means of supplementing field observations made on site. The use of laboratory data can provide an empirical format by which the presence of human settlement and site extent can be confirmed whether artifacts are present or not. The data can also serve as a useful analytical tool for evaluating the context of archeological components within a developmental and chronological sequence, as well as tie in gross geomorphic observations with site specific environmental history and landform evolution. Thus, it is very important to consider the accuracy and precision of the laboratory methodology employed when evaluating the significance of any particular set of geochemical parameters.

Accuracy may be defined as those test values that are clustered around a true value for a specific analytical procedure, while precision refers to the measure of random errors in a given analytical technique, i.e., the consistent reproducibility of measured results (Mausbach et al. 1982:26). There is an important distinction between the two since precision testing without regard to the potential bias of other geochemical variables can actually produce inaccurate or highly skewed results. For this reason it is most important to understand as many site soil characteristics as possible in order to assess the relative effectiveness of a given analytical method. Even when the analytical technique utilized is not the most precise possible, the results, if standardized, can still act as an accurate indicator for when more appropriate treatment may be desirable. For the purposes of archeological interpretation a variety of quantitative and qualitative methods can be useful in determining relative differences between the natural soil setting and degree of anthropic enhancement. In the interests of comparability, however, each of the methods utilized in processing the Cedar Grove (3LA97) and Sentell (3LA128) samples will be discussed in detail.

SAMPLE PROCESSING

The soil samples processed at the Toltec Station's Archeological Laboratory are tested under more or less controlled environmental conditions. Temperature and humidity controls are both kept at a constant 72 degrees F (22 degrees C) and 55% respectively, although fluctuations due to external atmospheric conditions account for variances of $\pm$ 4 degrees F in temperature and + 10% or more in humidity on occasion. Both temperature and humidity are monitored daily with supplemental control of the latter by a dehumidifier.

Equipment and glassware are all kept clean according to normal standards of laboratory procedure. Rinses with deionized water are routine on all containers or utensils where residual contamination may affect the next test series.

Before testing all soil samples were air-dried and allowed a 24 hour period of adjustment to the Toltec lab's atmospheric conditions. Each sample was gently hand ground in a porcelain mortar and pestle to avoid unwarranted crushing of any fine, nonquartzitic particles that may be present. Any sample containing very coarse particles was further screened to eliminate any grains greater than 2 mm. Individual samples were then stored in labeled, and capped, 20 dram polyethylene plastic vials until further, specific soil tests could be conducted. All test results were recorded on predesigned forms located in Table 1.

LABORATORY METHODOLOGY

The Cedar Grove and Sentell soil samples received from the Fayetteville lab were in either of two sample forms--5 g photo film vials for free carbonate testing, and approximately 55 g boxed samples for free carbonate and basic particle size determination (PSD). All samples were split for specific tests by weighing with a Sartorius (Model 1202 MP) electronic scale which can measure precisely to within $\pm$ 0.01 g. Each of the sample types were processed in the following sequence:

5 g sample-(1) free carbonate test, (2) Munsell color determination, (3) reweigh sample, (4) determine pH by a 1:2 ratio of sample to distilled H_2O, (5) determine EC (salts) by adding an additional three parts distilled water.

55 g sample-(1) hand grind less than 2 mm fraction with mortar and pestle, (2) free carbonate test, (3) Munsell color determination, (4) split 40 g for PSD work, (5) split 10 g for moisture factor determination, (6) use 10 g moisture factor split for pH determination, (7) determine EC with remaining sample.

CARBONATES

Several methods ranging from quantitative to the qualitative exist for the

Table 1. Cedar Grove, 3LA97 Hydrometer Data Record

atalog #	Provenience Provenience	Sample Weight	Time	H_2O Temp.	Sample/Blank Reading		Time	H_2O Temp.	Sample/Blank Reading		Moisture Determin. Air wt.	Oven Wt.	m.f.	Comments
.0-1209-1324	B. 9	40.0	12:30		8.5	4.2	11:00		8.0	4.3	18.08 + 10.0	28.00	1.002	
:0-1209-1400	Fea. 18 Zone 1	40.0	12:36		9.8	4.2	11:06		9.4	4.3	12.42 + 10.0	22.29	1.005	
:-751-09	BT1 S10 Seg. 3	39.0g	12:41		9.7	4.2	11:11 AM		9.0	4.3	15.40 + 10.0	25.28	1.004	
:1-751-10	BT1 S 9 Seg. 3	39.0g	12:45		19.0	4.2	11:15		16.5	4.3	17.90 + 10.00	27.60	1.010	
1-751-17	BT1 S 5 Seg. 4	39.0	2:30 PM		6.8	4.2	1:00 PM		6.7	4.3	18.08 + 10.00	28.01	1.002	
1-751-21	BT 1 S 8 Seg. 5	39.0	2:35		16.6	4.2	1:05		13.3	4.3	12.42 + 10.00	22.21	1.009	
1-751-22	BT 1 S 6 Seg. 5	38.0	2:40		11.7	4.2	1:10		9.0	4.3	15.40 + 10.00	25.22	1.007	
1-751-23 *	BT1 S 8 Seg. 7 Fea. 1	38.0	2:45		10.0	4.2	1:15		8.1	4.3	17.90 + 10.00	27.55	1.012	No pretreat-ment Anthropic A horizon ?
1-751-32	BT1 S 2 Seg. 8	39.0	2:50		7.4	4.2	1:20		6.6	4.3	18.08 + 10.00	27.99	1.003	
:-751-47	BT1 S11 Seg. 9	39.0	2:55		10.0	4.2	1:25		8.8	4.3	12.42 + 10.00	22.28	1.006	
1-751-48	BT1 S 4 Seg. 14	38.0	3:00		7.3	4.2	1:30		6.4	4.3	15.40 + 10.00	25.31	1.003	
.-751-49	BT1 S 3 Seg. 14	39.85	12:35 PM		6.0	4.0	12:05		7.0	5.8	17.90 + 10.00	27.84	1.002	
)-1209-508	BT2 S33	40.0	3:00 PM		6.3	4.0	1:30 PM		6.2	4.5	17.90 + 10.0	27.82	1.002	
)-1209-510	BT2 S4	40.0	3:05		9.8	4.0	1:35		9.5	4.5	18.08 + 10.0	27.96	1.004	
)-1209-511	BT2 S34	40.0	3:12		20.0	4.0	1:42		16.3	4.5	12.42 + 10.0	22.11	1.014	
)-1209-512	BT2 S5	40.0	3:15		9.0	4.0	1:45		8.0	4.5	15.40 + 10.0	25.30	1.003	
)-1209-513	BT2 S6?	40.0	3:20		7.2	4.0	1:50		7.2	4.5	17.90 + 10.0	27.83	1.002	
)-1209-515	BT2 Fea. 1 W.Muck Ditch	40.0	3:25		8.8	4.0	1:55		6.7	4.5	18.08 + 10.0	27.90	1.006	No pretreat-ment Anthropic A horizon?
)-1209-516	BT1 Fea. 2 Levee Fill	40.0	3:30		9.6	4.0	2:00		8.0	4.5	12.42 + 10.0	22.28	1.006	
)-1209-517	BT1 S4? Midden	39.99	10:20 AM		9.2	4.8	9:00 AM		6.7	4.4	15.40 + 10.0	25.23	1.006	No pretreat-ment Anthropic A horizon?
-1209-518	BT1 S7	40.0	10:35		9.1	4.8	9:05		8.0	4.4	17.90 + 10.0	27.79	1.003	
-1209-559	BT3 S36	40.0	10:41		8.8	4.8	9:11		8.0	4.4	18.08 + 10.0	27.97	1.003	
-1209-563	BT3 S37	40.0	10:45		11.0	4.8	9:15		10.2	4.4	12.42 + 10.0	22.28	1.006	
-1209-569	BT3 S38	40.0	10:50		7.9	4.8	9:20		7.3	4.4	15.42 + 10.0	25.33	1.003	
-1209-570	BT3 S35	40.0	10:55 AM		14.5	4.8	9:25 AM		12.0	4.4	17.90 + 10.0	27.71	1.006	
-1209-571	BT3 "Laminated Sands"	40.0	11:00		12.1	4.8	9:30		10.3	4.4	18.08 + 10.0	27.92	1.005	
-1209-574	BT3 S32	40.0	12:15 PM		9.6	4.2	10:48 PM		9.0	4.3	12.42 + 10.0	22.29	1.005	
-1209-581	BT3 S41	40.0	12:20		7.1	4.2	10:51		7.1	4.3	15.40 + 10.0	25.30	1.003	
-1209-1104	Fea. 15	24.82	12:25		7.4	4.2	10:55		6.0	4.3	17.90 + 10.0	27.76	1.005	

* highly organic - problem encountered w/washing out sand fraction

BT = Backhoe Trench
S = Stratum
F = Feature
B = Burial

determination of soil carbonates. The analytical technique employed is often tied to the desired results. The more precise quantitative methods are primarily concerned with the distinction between carbonate-C and organic-C, or using total carbonate-C as an index of $CaCO_3$ in the soil (Allison and Moodie 1965). When the relative amount or mere presence of soluble soil carbonate is desired a variety of rapid techniques for indirect measurement are commonly used. One of these tests involves the use of dilute 10% HCl to indicate the presence of free carbonates, a rapid method which is quite adequate for archeological purposes (Woods 1983).

Since the presence of carbonates can affect both PSD and organic-C values, it is very important to obtain some indication of the relative amount of carbonates present when conducting these other tests. Organic-C values are particularly sensitive to carbonate contamination and much stronger spot test of 4N HCl (33%) is normally used (Allison 1965). Therefore, the greater concentration of 4N HCl was used in conducting all spot tests for the presence of carbonates. This was accomplished by placing approximately 0.25 g of soil on a porcelain cavity plate, adding two to three drops of distilled H_2O to saturation (to displace any trapped air), and then adding two drops of HCl and noting any effervescence.

Effervescent reactions were recorded according to the following modified criteria (Birkland 1974:272):

NR-No Reaction
VS-Very Slight-few bubbles
SR-Slight Reaction-bubbles readily observed
MR-Moderate Reaction-bubbles form a low foam
VR-Violent Reaction-foam thick with "boiling" appearance

COLOR

All color assignments were made with the use of Munsell soil color charts. Color determination was standardized by viewing under 75 watt incandescent light and using only the author who has sufficient prior experience (Kaczor 1982). Samples were prepared in the same fashion as that of the carbonate test, or more often, determined immediately after that particular test. It should be noted that the laboratory designation is only that of primary soil color and does not reflect any degree of color mottling that may be present in the field profile. It is good policy, however, to determine primary color under controlled conditions whenever possible since shadows and the use of multiple workers may cause larger variations of color in the field situation than desirable.

pH

In general, soil pH is a measure of the degree of acidity or alkalinity that is represented by a standard scale, ranging from 0 to 14. pH values are logarithmic in relation to the active concentration of hydronium and hydroxyl ions

in solution (Figure 1). Thus, it is most important to obtain accurate and precise measurement of soil pH since even minor fluctuations in the pH scale may be significant.

Of the two accurate methods for determining pH, an electrometric, rather than the less precise colorimetric method was used. The instrument consisted of a Hach digital pH meter (Model 19000) with glass electrode and temperature constant brought to calibration by using two standard buffer solution of 4.01 and 9.0 respectively. The procedure consisted of stirring a 1:2 soil/water (distilled) mixture in a small beaker or plastic 20 dram vial, allowing the mixture to stand for 15 minutes, restirring, and taking a reading immediately after immersing the electrode into the sediment and waiting for it to attain equalibrium (about 25-50 seconds). The soil to water ratio used in determining pH is important since the effect of dilution at higher mixture ratios cn increase the pH by over one unit (Peech 1965:917). Narrower ratios of between 1:2.5 and 1:1 have been adopted to avoid this problem. The 1:2 ratio used here is in accordance with Woods (1983) as opposed to the 1:1 standard in use at the University of Arkansas Soil Testing and Research Lab in Fayetteville. Test results derived from each solution ratio, however, should still be very comparable (Wayne Sabbe, personal communication).

Calibration of the pH meter was made on a daily basis, or every other day when readings over a long period of use were consistent. Occasional spot checks with a buffer were made when large numbers of samples were read in one day. When differences of greater than 0.1 pH unit were detected standard procedure called for immediate recalibration of the instrument, although this was not a particular problem. It is very important to maintain a standardization of the pH meter since the glass electrode can and will lose its potential through repeated use. Without periodic calibration checks or the use of two standard buffers pH values can drift by as much as 0.8 pH unit with even the best instrumentation (Figure 2).

SOLUBLE SALTS

As applied to soils, soluble salts refer to the inorganic soil constituents, chiefly minerals such as sodium, potassium, calcium, and to some degree phosphorus that are appreciably soluble in water. Most of the agronomic work with salinity is primarily concerned with plant uptake and growth, although archeological features reflecting trash or occupation activity through enhanced soil salt concentrations can also be detected. One major drawback in using a salt meter is that it cannot detect the relative concentrations of individual salt minerals present. Thus, its usefulness is intended primarily as a quick reference for wholesale concentration changes and as guide to further testing of specific elements.

The procedure followed consists of mixing a soil-to-water (distilled) ratio of 1:5 in a small beaker or plastic 20 dram vial, allowing the mixture to settle for a few minutes, restirring, and then immersing the probe of a Hach (Model 17250) Mini Conductivity meter into the solution and taking a reading immediately after

pH Scale

Active Acid Concentration [H+]		pH		Active Base Concentration [OH−]	
10^{0}	1.0	0	↑	0.00000000000001	10^{-14}
10^{-1}	0.1	1		0.0000000000001	10^{-13}
10^{-2}	0.01	2		0.000000000001	10^{-12}
10^{-3}	0.001	3		0.00000000001	10^{-11}
10^{-4}	0.0001	4		0.0000000001	10^{-10}
10^{-5}	0.00001	5	Increasing	0.000000001	10^{-9}
10^{-6}	0.000001	6	Acidity	0.00000001	10^{-8}
10^{-7}	0.0000001	7	Neutrality (Pure Water)	0.0000001	10^{-7}
10^{-8}	0.00000001	8	Increasing	0.000001	10^{-6}
10^{-9}	0.000000001	9	Basicity	0.00001	10^{-5}
10^{-10}	0.0000000001	10		0.0001	10^{-4}
10^{-11}	0.00000000001	11		0.001	10^{-3}
10^{-12}	0.000000000001	12		0.01	10^{-2}
10^{-13}	0.0000000000001	13		0.1	10^{-1}
10^{-14}	0.00000000000001	14	↓	1.0	10^{0}

Figure 1. Simplified explanation of pH scale relative to the active hydronium ion concentration. Note the exponential increase or decrease of each pH unit. Taken from Fisher Electrode Handbook, Bull. 120F.

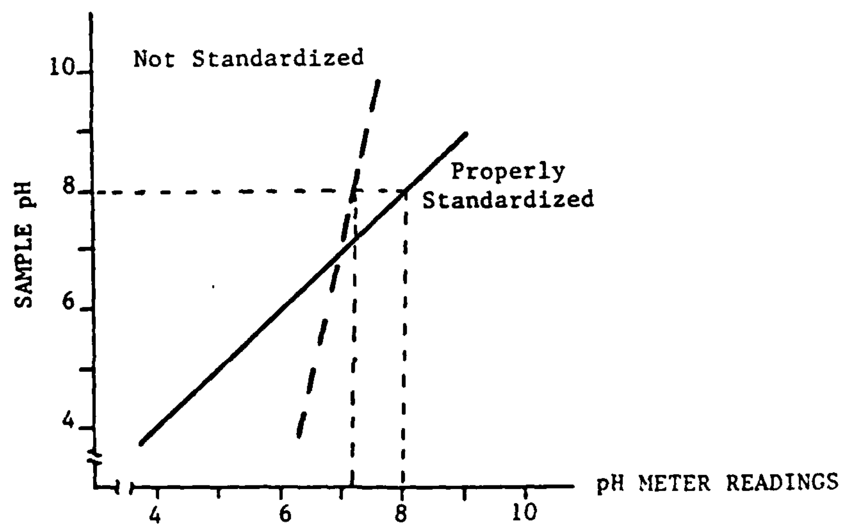

Figure 2. pH meter standardization. True sample pH is 8.0 but is read as 7.2 when not properly standardized. Taken from Hach News & Notes, V.6,No.3, Oct.,1982.

attaining equilibrium. The salt content is recorded as a measure of electrical conductance in EC x 10^6 or micromhos/cm and is standardized by temperature control and constant monitering. Since the electrical conductiviy of aqueous salt solutions is proportional to solution temperature, all readings are further adjusted by increasing 2% per centigrade degree to the standard reporting temperature of 25 degrees C (Bower and Wilcox 1965). All final figures are further rounded to the nearest decimal point.

The use of a 1:5 soil-to-water mixture is noteworthy since it contrasts with the normal 1:1 or 1:2 ratios routinely used at agronomy labs. The more concentrated mixtures are primarily intended to approximate conditions to which plant growth is affected, and therefore is not a particularly meaningful solution determination for archeological purposes. It is not only easier to process sampl at the 1:5 ratio (allowing for easier cleaning of the probe) but it is a more theoretically precise extraction solution for measurement of the salt concentratio (Bower and Wilcox 1965:933). A comparison of two different mixture ratios can be seen in Table 2. On 24 Toltec site samples from a variety of natural vs anthropic contexts, salt concentrations were measured at sample-to-water mixture ratios of 1:5 and 1:2 respectively. The average factor variance is 2.9 so that a reading of 67 at a 1:2 ratio would become 25 at 1:5. Thus, the significant difference in the salt concentrations reported between the two soil-to-water mixtures indicate that some form of factor compensation is obligatory if data from different labs/methods is to be compared. Lastly, it should also be noted that since the salt concentration represented is significantly affected by the soil/water ratio, precision measurement of both mixture components was maintained.

PARTICLE SIZE DETERMINATION (PSD)

The textural analysis of basic clay, silt, and sand particle sizes was made according to the hydrometer method described by Day (1965) and modified into a simpler format by Gee and Bauder (1979). Briefly, the Simplified Day Procedure requires no temperature calibration or conversion tables, and uses a weighted average of the 1.5 and 24 hour readings to determine only the 2μm clay fraction. These data were recorded on specifically designed forms that are included in Table 3. The sand fraction is obtained by pouring off the solution through a sieve (in this case a standard No. 325 mesh) and reweighing the fraction that is present after oven drying. The washed out silt fraction is determined by rather simple mathematics: 100-(% clay + % sand)=% silt.

Several methods of fractionation and particle-size analysis are known. For routine textural analysis, the pipette method of sampling a sedimentation cylinder at controlled depths and times yields greater precision than that of the commonly used hydrometer method (Day 1965:546). The Simplified Day Procedure was chosen, however, because it is less complicated, requiring little specialized equipment, and much more convenient for rapid determination of large sample numbers. Its only major drawback is that a size fractionation of the individual silt and sand fractions are not readily obtainable, although by recording solution temperature it may be possible to reconstruct a graphical curve of these

Table 2. Salt Extraction Ratios - Toltec site samples.

Mound B base	1:5	Sample-to-Water (in EC x 10^6)	1:2	Ratio Factor
80-710-11-6	20		84	4.2
80-710-11-7	21		53	2.5
80-710-11-8	32		96	3.0
80-710-11-9	29		95	3.3
80-710-11-10	44		116	2.6
80-710-11-12	27		71	2.6
80-710-11-13	27		80	3.0
80-710-11-14	32		69	2.2
80-710-11-15	70		120	1.7
				2.8
Mound E				
80-710-5-2	19		56	2.9
80-710-7-4	25		67	2.9
80-710-7-5	19		69	3.6
80-710-7-6	22		70	3.2
80-710-7-7	28		56	2.0
80-710-7-8	56		115	2.0
				2.8
RSA-I				
79-677-26-1	17		54	3.2
79-677-26-2	12		41	3.4
79-677-26-3	19		58	3.0
79-677-26-4	18		73	4.0
79-677-26-5	23		67	2.9
79-677-26-6	21		52	2.5
79-677-26-7	28		84	3.0
79-677-26-8	20		51	2.6
79-677-26-9	15		63	3.2
				3.2
			Total Avg. =	2.9

Table 3. Cedar Grove, 3LA97 Soil Sample Analysis Record

og #	Provenience	%clay	% silt	%sand	Texture Class	pH	(clay free) %silt	(clay free) %sand	Free $CaCO_3$	ECX10[b] * Salts	Munsell Color	Sand Fr wt. (g)	Comments
08-65	EWT3 S29 Sec 3					8.4			SR	50	5YR4/6		
08-66	EWT3 S30 Sec 3 cultural zone					7.8			NR	40	2.5YR3/4		
08-67	EWT3 S30 Sec 3 above cultural					8.0			VS	49	2.5YR3/4-3/2		
09-508	BT2 S33	4.6	23.9	71.5	SaL	8.4	25	75	SR	33	5YR4/6	28.54	
09-510	BT2 S [illegible]	12.7	24.0	63.3	SaL	8.1	27.5	72.5	NR	28	2.5YR3/4	25.2	
9-511	BT2 S34	32.7	34.4	32.9	CL	8.0	51	49	NR	50	2.5YR3/6	12.96	
09-512	BT2 S 5	19.8	13.2	67.0	SaL-SiCL	8.1	16.5	83.5	VS	37	2.5YR3/4	76.74	
9-513	BT2 S 6?	6.9	5.0	88.1	LSa-Sa	8.2	5	95	SR	29	5YR4/4-4/6	35.19	
9-515	BT1 Fea. 1 W.Muck Ditch	8.1	36.5	55.4	SaL	8.0	40	60	VS	59	2.5YR2.5/2	22.03	No pretreatment
9-516	BT1 Fea. 2 Levee Fill	10.6	34.6	54.8	SaL	7.7	39	61	VS	44	2.5YR3/2	21.79	
9-517	BT1 S 4? Midden	9.3	36.2	54.5	SaL	7.7	40	60	VS	48	2.5YR3/2	21.66	No pretreatment
9-518	BT1 S 7	9.2	36.2	54.6	SaL	8.0	40	60	NR	39	2.5YR3/6	21.76	
9-559	BT3 S36	8.9	11.8	79.3	LSa	8.0	13	87	NR	50	5YR4/6	31.61	
9-563	BT3 S37	14.1	14.0	71.9	SaL	7.9	16	84	NR	47	5YR4/6	78.59	
9-569	BT3 S38	7.5	14.4	78.1	LSa	8.0	16	84	VS	42	5YR4/4	31.14	
9-57?	BT3 S35	20.2	21.9	57.8	SiCL-SaL	7.8	27	73	NR	76	5YR3/4	22.99	
9-571	BT3 "Laminated Sands"	15.4	21.7	62.9	SaL	7.8	26	74	NR	74	2.5YR3/4	25.02	
9-574	BT3 S32	11.8	57.5	30.7	SiL	8.4	65	35	SR	66	2.5YR4/4	12.22	
9-581	BT3 S41	6.7	9.1	84.2	LSa	7.7	10	90	VS	36	5YR4/6	33.59	
9-657	B1					7.9			VS	30	2.5YR3/4		
9-676	LTU3 Fea 11					7.8			NR	51	2.5YR2.5/4		
9-682	LTU2 Fea 13					8.2			NR	35	2.5YR2.5/4		
9-693	Fea 10					7.8			NR	32	2.5YR3/4		
9-8?5	B?					8.1			VS	30	5YR4/4		
9-889	(Rib) B8					8.2			SR	25	5YR4/4		
9-907	B3					8.2			VS	42	5YR4/6		
9-979	Conch Shell 977 B7					8.2			SR	54	2.5YR4/4		
9-981	Shell 980 B7					8.1			MR	81	2.5YR3/4		Artifact inclusions
9-1011	B13					7.9			NR	39	2.5YR2.5/4		
9-1056	Fea 9					8.1			MR	63	2.5YR3/2		
9-1077	Fea 5					8.0			NR	25	2.5YR3/4		
9-1104	Fea 15	5.7	31.7	62.6	SaL	7.9	34	66	VS	44	2.5YR2.5/2	15.46	No pretreatment short sample Artifacts in sand fr.
9-1107	Fea 16					7.8			NR	28	2.5YR3/4		
9-1141	B7					8.1			SR	43	2.5YR3/6		
9-1164	B10					8.3			SR	45	2.5YR3/4		
9-1188	B9					8.2			SR	34	5YR4/6		
9-1216	(abdomen) B12					8.2			SR	32	2.5YR3/4		
9-1280	(rib) B14					8.0			SR	45	2.5YR3/6		
9-1324	B9	9.4	20.4	70.2	SaL	7.7	23	77	VS	48	2.5YR3/4	28.01	
9-1377	(chest) B15					8.1			SR	57	2.5YR2.5/4		
9-1398	Fea 18 Zone 3					8.1			VS	39	2.5YR3/4		
9-1399	Fea 18 Zone 2					7.7			VS	58	--------		sample saturated w/charcoal
-1400	Fea 18 Zone 1	12.6	28.7	58.7	SaL	8.0	33	67	NR	33	2.5YR2.5/4	23.36	
-1457	Vessel 1179 B9					8.2			SR	42	2.5YR3/6		
-1459	Vessel 1174 B9					8.1			SR	58	2.5YR3/4		
-1464	Fea 17					8.0			VS	45	2.5YR2.5/2		
-1466	B5					8.2			SR	38	2.5YR3/6		

[b] andardized to 25°C by + 2%/C°

Table 3. Sentell, 3LA128 Soil Sample Analysis Record

Catalog #	Provenience	%clay	%silt	%sand	Texture Class	pH	(clay free) %silt	(clay free) %sand	Free $CaCO_3$	$ECX10^6$ * Salts	Munsell Color	Sand Fr wt (gr.)	Comments
1-751-09	BT1 S10 Sec 3	11.8	26.3	61.9	SaL	7.6	30	70	NR	30	2.5YR4/6	24.05	
1-751-10	BT1 S 9 Sec 3	31.7	39.7	28.6	CL	7.3	58	42	NR	41	2.5YR3/6	11.04	
1-751-17	BT1 S 5 Sec 4	6	14.6	79.4	LSa	7.4	15.5	84.5	SR	39	5YR4/6-4/4	30 9	
1-751-21	BT1 S 8 Sec 5	35.7	39.5	24.8	CL	7.2	61	39	VS	71	2.5YR3/2	9.58	
1-751-22	BT1 S 7 Sec 5	14.9	46.4	38.7	Loam	7.2	54.5	45.5	VS	94	2.5YR3/2	14.59	
1-751-23	BT1 S 6 Sec 5	11.8	33.7	54.5	SaL	6.7	38	62	NR	148	2.5YR2.5/2	20.46	No pretreatment
1-751-30	BT1 S 8 Sec 7 Fea 1					7.7			NR	28	2.5YR5/4		
1-751-32	BT1 S 2 Sec 8	6.6	15.4	78	LSa	7.1	16.5	83.5	SR	42	2.5YR3/4	30.33	
1-751-47	BT1 S11 Sec 9	12.4	39.8	47.8	Loam	7.8	45	55	VS	50	2.5YR3/6	18.53	
1-751-48	BT1 S 4 Sec 9	6.4	26.8	66.8	SaL	7.6	29	71	SR	49	2.5YR3/4	25.32	
1-751-49	BT1 S 3 Sec 14	3.7	9.3	87.0	Sand-LSa	7.9	10	90	SR	32	5YR4/4	34.62	
-751-90	TU2 Fea 5 South					7.4			NR	42	2.5YR2.5/2		
1-751-114	TU4 Fea 6					7.6			VS	44	2.5YR3/2		
1-751-124	TU5 PM 7					7.8			NR	24	2.5YR3/4		
80-1108-11	TU1 Fea. 1					-			-	-	-		sample all daub
80-1108-17	TU5 PM1 interior					8.1			VS	38	2.5YR3/4-3/2		
80-1108-18	TU5 PM1 exterior					7.9			NR	37	2.5YR3/4		
80-1108-34	TU1 Fea. 1					7.9			NR	42	2.5YR2.5/2		
80-1108-35	TU4 Fea. 2 Levee					7.9			NR	35	2.5YR2.5/4		
80-1108-36	EWTR4 Fea. 2					8.1			NR	41	2.5YR2.5/4		
80-1108-37	EWTR4 Caddo House 1 Midden					8.0			NR	38	2.5YR3/2		
80-1108-37	TU 2 S 1					8.5			SR	45	5YR4/4		
80-1108-39	NST 2 S.2					8.1			NR	48	5YR3/4		
0-1108-40	NST 2 S.3					8.3			SR	53	2.5YR3/4		
0-1108-41	NST 2 S 4					8.0			VS	34	2.5YR3/4		
-1108-42	NST 2 S. 5					7.7			NR	45	2.5YR3/4		
0-1108-43	NST 2 S. 6					7.7			NR	43	2.5YR3/4-3/6		
-1108-44	NST 2 S. 7					8.2			NR	36	2.5YR3/4		
-1108-45	NST 2 S. 8					8.3			SR	35	2.5YR3/6		
-1108-46	TU 2 S 9					6.2			VS	88	2.5YR3/2		
-1108-47	TU 2 S10					8.3			SR	43	2.5YR3/4		
0-1108-48	NST 2 S11					8.4			SR	47	2.5YR3/6		
-1108-49	? S11					8.4			SR	52	2.5YR3/6		
-1108-50	TU 2 S12					8.6			SR	48	2.5YR3/6		
-1108-51	TU 2 S13					8.3			SR	60	2.5YR3/4		
-1108-52	TU 2 S14					8.0			VS	35	2.5YR3/4		
-1108-53	TU 2 S15					8.0			NR	28	2.5YR3/6		
-1108-54	TU 2 S16					8.1			VS	23	2.5YR3/6		
-1108-55	TU 2 S17					8.4			SR	21	2.5YR4/6		
-1108-56	TU 1 S20					8.0			NR	30	2.5YR2.5/2		
-1108-57	TU 1 S21					7.9			VS	41	2.5YR3/4		
-1108-58	TU 1 S22					8.0			SR	29	2.5YR4/4		
-1108-59	TU 2 S23					7.9			NR	24	2.5YR3/4		
-1108-60	TU 4 S24					8.0			NR	25	2.5YR2.5/4		
-1108-61	TU 4 S25					8.0			VS	24	2.5YR2.5/4		
-1108-62	TU 4 Fea. 2 S26					6.1			NR	25	2.5YR3/4		
-1108-63	EWT 3 Sec 3 S27					8.4			SR	41	5YR4/6		
-1108-64	EWT 3 Sec 3 S28					8.3			SR	46	5YR4/6		

* Standardized to 25°C by + 2%/C°

fractions. It should also be noted that while there are pros and cons to determinating the sand fractions by either sedimentation chamber or sieving, the latter is considered to yield more accurate results, depending on grain shape (Blatt et al. 1972:47-55). Along theoretical lines, then, the determination of clay-size particles by hydrometer and sand-size particles (or any fraction thereof) by sieving should provide sufficient accuracy and precision for routine textural analysis and environmental reconstruction.

The materials and procedure in utilizing the Simplified Day Hydrometer Method for determining basic particle-size classes are detailed in Appendix 13-1. Samples were not mixed in standard soil cups or with the normal electric mixer, but substituted with large plastic tumblers (with slick finished inner chamber so as not to allow clay-size particle adhesion) aproximating the size of the standard stainless steel cups. In place of the standard mixer a model 597 Skil brand 3/8" hand drill with a fabricated stainless steel shaft and ASTMD-422 stirring paddle was substituted. Sample mixing was accomplished by placing the soil cup below a ring clamp/stand setup and inserting the mixing shaft to within 0.5 cm of the cup bottom.

The hand drill puts out 750 r.p.m. or one-half that of a standard ASTM approved mixer. In order to compensate samples were occasionally stirred by glass rod before and after mixing, and left to sit overnight. All samples were inspected during pour-off into the sediment cylinders to insure complete dispersion of all clay aggregates. No particular dispersion problems were noted and the author feels that nay potential error is within 1% and not more than 2% for any high clay sample.

All clay, silt, and sand size particle fractions are reported as a percentage of 100 with no allowance made for the presence of cellulosic organics in the sand fraction. Because these residues are quite common they are often treated as constants and simply ignored by most labs since the necessary pretreatment for their removal would be very laborious and time-consuming. It should be noted, however, that the reporting difference in sand fractions between deeper subsoil samples and highly anthropic samples may be in error by a small percentage.

All soil texture class designations (e.g., sandy clay loam) reported were determined by the above mechanical analysis according to the standard categories as defined by the Soil Survey Staff (1975:470-471). In cases where the basic particle fractions bordered on two or more texture classes, the primary class (if perceptable) was noted first and then followed the ancillary ones. The soil textures listed are coded in shorthand as follows:

LSa-loamy sand
SaL-sandy loam
SaCL-sandy clay loam
SaC-sandy clay
CL-clay loam
SiC-silty clay
SiCL-silty clay loam

SiL-silt loam

Additional calculations on the silt and sand fractions for a clay free basis were made to enhance any lithologic discontinuities that may be present but disguised by incipient pedogenesis. The clay-free percentages were determined by the following formula:

(100/Si + Sa, clay basis) % frac=% frac, clay free

or

100/x + y y=$\bar{y}$, clay free; x=Silt % clay basis y=Sand % clay basis

RESULTS

All the soil test performed on the Cedar Grove and Sentell site samples were reasonably concluded within the initial guidelines setup for accuracy. Notable exceptions to this consisted of samples: 80-1108-11 which contained baked clay/daub and no soil that could be tested; 80-1209-1104 which contained a less than desirable amount of soil for PSD after the removal of artifacts; and 81-751-23 which contained an inordinate amount of cellulosic residue that could not be flushed out of the sand fraction. I doubt that the proper dispersion of 2.65 g/ml was attained for sample 80-1209-1104 during PSD, so the reported clay fraction should be suspect. It may be wise to rerun this sample if possible. PSD samples 80-1209-515, 80-1209-517, 80-1209-1104, and 81-751-23 contained noticeably enhanced A horizon characteristics. Since none were requested, no pretreatment for the removal of organics was performed, thus reported clay percentages may negatively deviate by as much as 2% (Day 1965:565). Of the four samples in this category, No. 81-751-23 is probably the most significantly affected.

Since the small soil samples tested were less than normal amounts used for obtaining a solution mixture, precision measurement of the H_2O fraction was made with a 25 ml cylinder to within the nearest 0.5 ml. A precursory comparison of the actual pH and EC ranges within blocks of consecutive catalog numbers shows a substantial amount of relative consistency. Thus, I believe that the small soil sample size has had no effect on the actual figures determined.

DISCUSSION

Without going into details of exact sample provenience and background soil context, a few observations can be offered.

The Cedar Grove site samples tested show an interesting range of soil chemical variability. pH ranges from a basic 7.7 to 8.6 indicating that the soils there are naturally alkaline and being culturally buffered on occasion by small increments of approximately 0.5 or less of a pH unit. pH values tend to

gradually scale up or down in small clusters between consecutive sample numbers which probably indicates episodic deposition an/or the effects of cultural zonation. In general, higher pH values tend to be associated with higher EC values and some form of carbonate reaction (Very Slight-Slight Reaction). These "triangle" figures should be checked against the cultural vs noncultural zones of unit profiles. In cases where EC (implied salt content) readings are relatively higher, but the pH is lower and there is no carbonate reaction, further testing will probably reveal higher levels of a single salt mineral such as potassium or phosphorus.

Texture class differences, especially on a clay-free basis, indicate fairly substantial shifts in depositional regime for Cedar Grove and an apparent cultural preference for sandy loam surfaces. The sand fractions are predominently skewed toward very fine particle sizes, although a few samples contain coarser sizes indicative of very active depositional hydrology.

The number of carbonate reactions represented, whether of natural origin or through cultural inducement from burials or occupation, are high and should be consulted in reporting any organic-carbon amounts (particularly for VS-SR or MR labeled reactions). Soil samples with SR and MR reactions should be candidates for carbonate removal before determining the % organic-C. I don't believe that the PSD samples were affected to any significant degree.

The Sentell site samples show even more variability in texture class and depositional environment that that of Cedar Grove, ranging from a clay loam to loamy sand. Sand fractions also tend to be skewed toward vey fine particle sizes, although coarser sizes are present in the sandy loam samples. pH values cluster to within a slightly basic, narrower range of 7.2 to 7.9. The one notable exception is highly anthropic sample 81-751-23 which registered a slightly acid pH of 6.7 and the highest EC reading of 148. Since no carbonate reaction was seen in this sample, I suspect that the EC reading (coupled with acid pH) indicates the presence of a high phosphorus concentration. Some form of unique geochemistry is taking place with this sample since higher, not lower, pH values are normally associated with anthroposized soil horizons. Only two other samples exhibit "higher" conductivity values and are associated sample numbers 81-571-21 and 22.

Carbonate reactions are mixed, bearing no particular trend that can be readily ascertained although I suspect that there is certain amount of naturally occurring carbonate in the soil. Considering the ph values, this would come as no great surprise. The same potential problems of carbonate contamination also apply as that with the Cedar Grove samples.

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APPENDIX II

PARTICLE SIZE DETERMINATION (PSD) PROCEDURES UTILIZING THE SIMPLIFIED DAY HYDROMETER METHOD

Materials

A standard hydrometer (ASTM 152H) with Bouyoucos scale in g/l.

An electrically driven mixer with replaceable stirring paddle (ASTM D-422). Soil cup(s) (ASTM D-422) for mixing sample.

Heavy walled, blank glass cylinders (Pyrex No. 2962) marked at the 1000 ml level and at 36 cm from the inside bottom.

Brass plunger consisting of a circular plate 13 mm thick by 4.9 cm diameter with a 0.9 cm by 50 cm rod fastened normal to the plate at its center.

Dispersing agent stock solution of 10% sodium hexametaphosphate, obtained by mixing 1000 g $NaPO_3$ per liter of distilled water and adjusting the pH to 8.3 by adding 6+ grams of sodium carbonate ($NaCO_3$) per liter of solution.

Standard lab oven and aluminum tins with lids for moisture determination.

Procedure

1. Determine whether sample is from topsoil (A horizon) or subsoil (B/C horizon). If from the A horizon proceed to step 2, if from the B or C horizon (except for a buried A) proceed to step 3.

2. All soil horizons of 3% or more Organic Matter need to be pretreated for O.M. removal before the PSD can be made. If the background O.M. for a natural soil development is unknown, then the % O.M. needs to be determined. All midden and anthropic soil samples should be automatically tested, or the % clay determination will be skewed towards lower values.

3. Weigh out 50.00 grams of air dried soil for analysis. Gently grind in a mortar to break up any soil chunks or aggregates.

4. Split out a 10.00 g sample and place into a moisture tin. Record weight and place into an oven without lid at 105 degrees C overnight (or at least 10 hours). Place lid(s) on before taking out of oven and allow to cool about 30 minutes. record the weight of the sealed tin with sample. Remember to mark a sample number on both the can and lid with a lead or wax pencil.

5. Place 40.00 g of soil in a mixing cup. Add 50 ml of dispersing agent, then 450-500 ml of water. Stir vigorously with a glass rod, using a wash bottle to rinse the rod of soil when extracting it. Let sample solution stand for at least 10 minutes (it may be left overnight if enough sample cups are available).

6. Mix for 5 minutes with the motor mixer. Again use a wash bottle to rinse the stirrer of soil particles.

7. Transfer sample to a marked sedimentation cylinder. Be sure to rinse soil cup completely free of all soil particles. Bring the solution level up to the 1000 ml mark with additional water. This should also be 2 cm $\pm$ of the 36 cm mark on the cylinder.

8. Add 50 ml dispersing agent and 950 ml of water to a cylinder marked as the "Blank".

9. Mix the blank and sample cylinder contents thoroughly by inserting the plunger and stroking vigorously (keeping one hand firmly on the cylinder to steady it). Remove the plunger, rinsing it gently with a wash bottle and tipping it slightly to remove adhering drops of soil suspension. Record the time. If the surface becomes too foamy, add 1 drop on amyl alcohol.

10. At 1.5 hours and 24 hours from the mixing time respectively, gently insert the hydrometer and record the reading (R) at the top of the solution menicus according to the "highlight method" (by viewing the hydrometer from an angle of 10 degrees to 20 degrees above the plane of the liquid and noting the bright diffraction image formed on the scale by a light held in front of the forehead and shielded from the eyes). Record the Blank reading (R_L) as well.

    Note that temperature recording are not necessary in this procedure, but may provide meaningful background data when samples are run in non-controlled, widely fluctuating room temperatures.

11. Remove sample from cylinder by washing through a 300 mesh (USDA scale) or 325 (U.S.G.S. scale) screen. Note which one is used.

11a. When removing the sample from the cylinder, pour off the suspended clay fraction first, then add some of the Blank solution, agitate, fill cylinder with water, wait 30 seconds and pour off the silt fraction. This will

make washing the sand fraction easier.

11b. After a thorough rinse of the sand fraction, tilt screen to one side for easier pour off of the sand fraction. Transfer sand to a beaker or evaporating dish by using a wash bottle only. Do not touch screen! Turn screen around and tip back towards the body, using a spray bottle to "flush" the screen of any remaining fine sands. Pour off in the same manner as above.

12. Decant excess water and free organics.

13. Oven dry sand fraction at 105 degrees C overnight (or at least 10 hours).

14. Weigh sand fraction to nearest 0.00 g if possible. If a sand fractionation is desired, then transfer sample to a nest of sieves on a mechanical shaker. Process 5 minutes, then weigh and record each fraction.

Calculations

moisture factor (MF)=air dry wt. of soil/oven dry wt. of soil

% clay=$P_{2\mu m}$-P_{24}+$KP_{1.5}/2$

where P=C/Co x 100% and K=0.876 mean weighing factor (constant)

and Co=oven dry weight of sample (40 + MF); C=concentration of soil in suspension or C=R-R_L with R=hyrometer reading at specific time; and R_L the blank hydrometer reading

% total sand=100 x (weight of fraction/sample weight) x MF

% total silt=100-(% total sand + % clay)

University of Arkansas Department of Agronomy tests for particle size determination, organic carbon, and cations

Fine Earth Particle Size Distribution (%)*

Stratum	Sample 80-1108-	Sand (mm) VCS 2-1	CS 0-.5	MS .5-.25	FS .25-.1	VFS .1-.05	TS 2-.05	Silt (mm) CSI 50-20	MSI 20-5	FSI 5-2	TSI 50-2	Clay TC 2um	EX Class
2	39	0.0	0.1	0.0	0.1	33.6	33.8	33.8	9.8	5.8	49.4	16.8	l
3	40	0.0	0.0	0.0	0.6	41.9	42.5	36.9	9.1	1.0	47.0	10.5	l
4	41	0.1	0.2	0.2	1.2	36.6	38.3	32.5	12.2	3.1	47.8	13.9	l
5	42	0.0	0.0	0.0	0.2	19.9	20.1	41.5	15.8	3.3	60.6	19.3	sil
6	43	0.0	0.0	0.0	0.2	24.7	24.9	45.2	13.2	3.6	62.0	13.1	sil
7	44	0.0	0.0	0.0	2.5	37.1	39.6	33.2	9.6	3.8	46.6	13.8	l
8	45	0.0	0.0	0.0	0.8	64.3	65.1	24.7	4.2	1.5	30.4	4.5	vfsl

Stratum	Sample 80-1108-	pH 8C1a	Total Carbon% 6A2b	5A3 Extractable Bases 6Q2b II	6N2e Ca	6O2d Mg	672b Na	Ext. Acidity 6H1a	Sum Base	Sum Cations 5A3a	Base Sat. % 5C3
				- - - - -Meq/100 g soil- - - - - - - - - - - - - - -							
4	41		0.63	0.1	16.8	1.9	1.43				
5	42		0.28	0.1	13.8	2.6	0.0				
6	43		0.22	0.0	11.4	2.0	0.0				
7	44		0.44	0.0	13.4	2.2	0.0				

(All samples are from west profile of N-S Trench 2)
All analysis run in duplicate. All data on oven dry basis
*Sands by seiving; remainder by hydrometer method of SSSAP 20:167-169 (1956). All other method citations are from Soil Survey Investigations Report No. 1, SCS USDA (1972)
0.0- 0.5 meq/100g (cations only)

APPENDIX III
SOILS ANALYSIS OF CEDAR GROVE AND SENTELL SAMPLES
University of Arkansas
Soil Testing and Research Laboratory

Soils analysis of samples collected in the June 1980 tests

Field Sample Number (80-1108-)	Unit Designation	Location	pH	Organic % O.M.	Parts per million lb/A P	lb/A K	lb/A Ca
10	W Muck Ditch	TU1 Fea 1	7.8	0.7	56	100	2450
11	W Muck Ditch	TU1 Fea 1	7.9	0.9	62	120	2700
12	W Muck Ditch	TU1 Fea 1	7.8	0.9	67	110	2700
17	Postmold 1	TU5	8.1	0.3	81	100	2400
18	Outside PM1	TU5	8.0	0.3	73	120	2400
34	W Muck Ditch	TU1 Fea 1	8.0	0.8	49	120	2700
35	Levee	TU4	7.9	0.5	75	115	2300
36	Levee	E-W Tr 4	7.9	0.6	53	155	2300
37	Caddo Str 1	E-W Tr 4	7.9	0.3	102	130	2500
38	Stratum 1	TU2	8.3	0.2	14	100	2550
39	Stratum 2	N-S Tr 2	8.1	0.5	26	240	2300
40	Stratum 3	N-S Tr 2	8.2	0.2	17	180	2500
41	Caddo IV mid	N-S Tr 2	7.8	0.7	25	220	2500
42	Stratum 5	N-S Tr 2	7.7	0.4	56	185	2450
43	Stratum 6	N-S Tr 2	7.7	0.4	49	105	2200
44	Stratum 7	N-S Tr 2	7.9	0.3	34	100	2350
45	Stratum 8	N-S Tr 2	8.0	0.2	25	90	2200
46	Stratum 9	TU2	7.8	0.9	7	210	3750
47	Stratum 10	TU2	8.1	0.3	8	130	2750
48	Stratum 11	N-S Tr 2	8.2	0.4	6	145	2450
49	Stratum 11	?	8.2	0.4	8	90	3000
50	Stratum 12	TU2	8.2	0.4	6	100	3100
51	Stratum 13	TU2	8.2	0.4	5	100	3000
52	Stratum 14	TU2	8.1	0.4	34	80	1950
53	Stratum 15	TU2	8.0	0.2	28	95	1900
54	Stratum 16	TU2	8.0	0.2	26	110	1700
55	Stratum 17	TU2	8.3	0.2	22	65	1800
56	Stratum 20	TU1	7.9	0.8	65	115	2750
57	Stratum 21	TU1	8.0	0.3		105	2400
58	Stratum 22	TU1	8.0	0.3	56	85	1900
59	Stratum 23	TU1	8.0	0.5	59	135	2250
60	Stratum 24	TU4	8.1	0.5	64	75	1900
61	Stratum 25	TU4	8.1	0.3	58	65	1500
62	Stratum 26	TU4	8.0	0.3	57	100	1800
63	Stratum 27	E-W Tr 3	8.2	0.3	14	100	2200
64	Stratum 28	E-W Tr 3	8.1	0.3	12	155	2700
65	Stratum 29	E-W Tr 3	8.0	0.2	15	130	3000
66	Stratum 30	E-W Tr 3	7.6	0.6	32	210	3950
67	Stratum 31	E-W Tr 3	7.7	0.7	37	240	4300

Soils analysis of samples collected in the mitigation of 3LA97.

Field Sample Number (80-1209-)	Unit Designation	Location	pH	% O.M.	lb/A P	lb/A K	lb/A Ca	lbs/A Na	lbs/A Mg	Cond. ECx10^3
					Organic Parts per million					
508	Stratum 33	BHT #2	8.5	0.1	72	70	3400	110	160	68
510	Stratum 4	BHT #2	8.1	0.5	18	130	2600	120	340	82
511	Stratum 34	BHT #2	8.0	0.7	108	330	4600	150	820	120
512	Stratum 5	BHT #2	8.3	0.2	162	120	2000	130	380	68
513	Stratum 6?	BHT #2	8.5	0.2	16	60	2300	130	180	50
515	W. Muck Ditch	BHT #1	8.1	1.2	64	170	3200	160	730	160
	Feature 1									
516	Levee Fill	BHT #1	7.9	1.2	114	150	3100	110	370	160
	Feature 2									
517	Midden									
	Stratum 4	BHT #1	8.2	1.6	39	130	3400	120	640	150
518	Stratum 7	BHT #1	8.3	0.6	54	100	1900	130	470	120
559	Stratum 36	BHT #3	8.2	0.3	63	100	2000	140	260	150
563	Stratum 37	BHT #3	8.2	0.3	148	140	2600	110	310	112
569	Stratum 38	BHT #3	8.3	0.2	162	60	1700	110	220	70
570	Stratum 35	BHT #3	8.1	0.9	13	200	3700	120	690	180
571	Laminated Sands	BHT #3	8.4	0.5	11	120	2500	130	390	180
574	Stratum 32	BHT #3	8.6	0.2	13	120	4600	120	260	150
581	Stratum 41	BHT #3	8.1	0.3	162	80	1500	110	250	150
657	Grave Fill	Burial 1	8.3	0.3	162	130	2200	130	200	120
	Burial 1									
676	Feature 11	TU 3	8.0	0.3	162	150	3000	120	290	100
682	Feature 13	LTU 2	8.4	0.3	10	190	3500	130	510	160
693	Feature 10	LTU 2	8.1	0.3	162	190	3500	120	370	130
845	Burial 4	LTU 2	8.6	0.3	56	100	2800	110	190	55
	Grave Fill									
889	Burial 8	LTU 2	8.6	0.3	59	100	2500	110	220	48
	Rib area									
907	Burial 3	LTU 2	8.4	0.3	82	90	3200	120	340	100
	Grave Fill									
979	Burial 7	Burial 7	8.3	0.5	37	100	3900	120	330	160
	Conch Shell									
	Fill 977									
981	Fill from									
	shell 980	Burial 7	8.6	0.5	25	100	3300	120	170	160

(continued) Soils analysis of samples collected in the mitigation of 3LA97.

Field Sample Number (80-1209-)	Unit Designation	Location	pH	% O.M.	lb/A P	lb/A K	lb/A Ca	lbs/A Na	lbs/A Mg	Cond. $ECx10^3$
1011	Burial 13 Grave Fill	Burial 13	8.4	0.5	40	120	2300	100	190	220
1056	Feature 9		8.7	0.7	21	140	5800	120	240	150
1077	Feature 5		8.5	0.7	162	210	3400	120	330	100
1104	Feature 15		8.2	0.7	162	240	3200	120	250	60
1107	Feature 16		8.2	0.6	83	160	2400	120	190	62
1141	Burial 7 Grave Fill	Burial 7	8.7	0.4	14	90	3100	120	360	62
1164	Burial 10 Grave Fill	Burial 10	8.8	0.3	10	90	3000	120	380	62
1188	Burial 9 1177 bowl fill	Burial 9	8.6	0.3	10	90	3200	120	180	62
1216	Burial 12 Abdomen fill	Burial 12	8.7	0.3	10	90	2800	130	300	62
1280	Burial 14 Rib fill	Burial 14	8.6	0.3	162	70	2700	100	180	78
1324	Burial 9 Grave fill	Burial 9	8.6	0.2	162	100	3100	100	190	[illegible]
1377	Burial 15 Grave fill	Burial 15	8.4	0.5	162	140	3800	120	210	92
1398	Feature 18 Zone 3	Zone 3	8.5	0.6	162	220	5000	120	290	92
1399	Feature 18 Zone 2	Zone 2	8.5	2.8	162	570	5400	150	780	105
1400	Feature 18 Zone 1	Zone 1	8.4	1.0	162	180	2900	130	270	138
1457	Soil from vessel 1179	Burial 9	8.6	0.2	162	90	3200	100	190	138
1459	Soil from vessel 1179	Burial 9	8.6	0.3	162	100	3800	110	190	138
1464	Feature 17		8.5	1.9	162	380	5500	120	360	138
1466	Burial 5 Grave fill	Burial 5	8.6	0.2	162	80	2800	120	250	90

(continued) Soils analysis of samples collected in the testing of 3LA128.

Field Sample Number (81-751-)	Unit Designation	Location	pH	% O.M.	lb/A P	lb/A K	lb/A Ca	lbs/A Na	lbs/A Mg	Cond. $ECx10^3$
					Organic Parts per million					
09	Stratum 10	BHT #1 Seg. 3	8.1	0.5	95	140	1600	120	710	50
10	Stratum 9	BHT #1 Seg. 3	7.9	0.6	117	300	3900	130	820	100
17	Stratum 5	BHT #1 Seg. 4	8.0	0.6	162	170	2600	100	310	65
21	Stratum 8	BHT #1 Seg. 5	7.8	2.2	162	780	3900	130	610	150
22	Stratum 7	BHT #1 Seg. 5	7.7	2.2	162	600	3900	120	530	150
23	Stratum 6	BHT #1 Seg. 5	7.2	4.0	162	530	5300	130	770	170
30	Stratum 8	BHT #1 Seg. 7	7.9	1.6	162	570	2800	120	380	100
32	Stratum 2	BHT #1 Seg. 7	7.9	1.4	162	150	2400	110	290	60
47	Stratum 11	BHT #1 Seg. 14	8.6	0.3	23	120	3000	130	220	70
48	Stratum 4	BHT #1 Seg. 14	8.3	0.7	54	180	2900	150	240	70
49	Stratum 3	BHT #1 Seg. 14	8.6	0.3	58	200	2800	110	230	70
90	Feature 5 South	TU 2	7.8	1.4	162	500	3700	120	510	92
114	Feature 6	TU 4	8.1	1.9	162	210	2600	120	290	92
124	Post Mold 7	TU 5	8.3	1.0	162	190	2500	120	250	92

APPENDIX IV
DESCRIPTION OF THE RED RIVER
BY DON DOMINGO TERAN DE LOST RIOS
NOVEMBER 29 TO DECEMBER 3, 1691

(Editor's note: This early description of the Red River appears in translation in a source not readily available in most libraries (Hatcher 1932). The sections of the translation pertaining to the Red River explorations of Teran are reproduced here and may be compared against Teran's 1691 map (Figure 4-1) which is presumed to be the same stretch of river on the north edge of Bowie County, Texas that he explored by Indian canoe. Some translations of terms are provided below for help in interpreting the discussion.)

Some Terminology:

alférez: an ensign or Second lieutenant
ranchería: group of huts, a hamlet, settlement, or cluster of small houses
rancho: hut or camp
League: estimate common land league of 1700s is just over 2.76 miles
span: a small measure, sometimes listed as 3 inches, but more probably a hand span of 8 1/4" breadth
caddí: Indian political/religious leader

On the 29th, having taken a look at the river about nine o'clock in the morning, I asked the alférezes and the pilots their opinion regarding it. To this they answered that, according to appearances it was navigable at that time, but that they could not be sure without having a longer time to verify the fact. The alférez, Don Alexandro Bruno, agreed with this opinion. He added that he would have to navigate it to be perfectly sure, and that there was not sufficient time in which to build a vessel and prepare the necessary provisions for a trial. He declared also that we lacked the requisite equipment. I agreed, realizing his willingness and his regret at the labor of the exploration, and the necessity for returning without carrying out the instructions of the viceroy in any particular. Besides the labor involved in the trip that had already been made, I had in mind the hardships yet to be endured on the return trip. While coming back to our camp from the river, we discovered a canoe in a slough. In this, the aforesaid polit, two of the men, and myself set out to explore the source of the stream and to find its mouth. We sounded and found it to contain about fifteen fathoms

of fresh water. It had no current whatever. We could not find the source, nor could we even determine the direction in which it ran. We, therefore, decided that it did not open directly into the river. We consequently went back to camp, leaving the canoe. We located at the home of one of the Mandones Indians... Alferez Don Alexandro (Bruno) came to me to suggest we launch the canoe and make such soundings as we could. I agreed to this, and suggested that the exploration of the lower stretches of the river ought to be continued for several days. Those to whom I mentioned the plan, objected on the ground that the canoe was not suited for this work, as it would require sails to make it possible to come back up the stream. They suggested alternatives, none of which were very helpful. On the 30th, it was not possible to carry the canoe to the river, because the interpreter told me that the Caddí was displeased because I had left his home...I noticed his resentment, and this forced me to return and set up camps at his ranchería. On December 1st, after the caddí had seen my willingness to meet his wishes, and my appreciation of his feelings, he summoned an older brother of his to approach and receive the baton, emblem of authority--it being the custom for the youngest to thus bestow it—and ordered this brother to go to the aforesaid lagoon in company with certain Indians and aid us in carrying the canoe over to the river. This was done immediately with the precaution suggested me by Alférez Don Alexandro (Bruno), that of taking the mule ropes with which to haul the canoe. By means of these my people and twenty of the Indians succeeded in getting it to the bank. The alférez got into it immediately with two men. He carried a pole about twenty spans long, which he asked me to have cut for him. With this he sounded the river from the point at which the canoe was launched to the place we finally landed. On returning to camp I found that the Reverend Father Commissary and his companions had arrived, but that Captain Don Gregorio Salinas had not been willing to come because the first order he had received had been in writing, while the second was verbal. There was not a scrap of paper on which to write. On the second it was not possible to accomplish anything whatsoever because of the sleet and rain which fell. On the next day, I again started for the river. There was in my company Alférez Don Alexandro Bruno and the pilots. Approaching the place where the alferez had fastened the canoe, he immediately got into it with his arms and instruments. Three seamen and myself accompanied him. We went down the river until he estimated that we had gone three leagues by the stream's windings. He declared that the sounding showed fifteen or twenty spans along the main channel and that allowing for deeper and shallower spots, it must average a depth of nine or ten spans in its main course. He remarked to me that the river was at this time in its regular bed. However, the three seamen using their oars, the alférez (with his pole) could not make the return trip against the current, until it was decided to move close to the bank, that is in the still water. Two men towed the boat and the alférez and the other man kept it from running aground. In this way we continued the trip at a fairly good rate of speed, about a league an hour. It took us from one o'clock in the day until dark to cover the distance to the starting point. From this place we then returned to camp (Hatcher 1932:33-35).

APPENDIX V
HISTORIC ARTIFACT PROVENIENCE SUMMARY

Historic artifact provenience summary

Provenience	Level	Glass	Ceramics	Metal	Miscellaneous	?
E-W Trench 2	stratum 2	1 clear neck		16 can fragments		
E-W Trench 4				1 piece iron		
LTU 0	overburden					1
LTU 1	overburden	1 clear				
		1 green				
LTU 2	overburden	3 clear	2 stoneware	1 nail		
		1 milk		6 iron		
LTU 3	overburden	1 clear		5 nails		
				3 pieces iron		
LTU 4	overburden	6 clear	1 porcelain	7 pieces iron		1
			button			
LTU 5	overburden	2 clear	1 stoneware	23 hogwire		4
				1 piece iron		
LTU 6	overburden	6 clear		1 piece iron		
LTU 7	overburden	4 clear		2 nails		
		1 brown		4 pieces iron		
West/LTU 6&7	overburden	17 clear		16 hogwire		
	and Feature 1	1 bottle		1 wire nail		
LTU 8	overburden	2 clear	1 stoneware	1 .32 brass shell		4
				7 pieces iron		
				1 hogwire		7
West/LTU 7&8	overburden			5 nails (4 wire)		
				4 wire staples		
				36 pieces iron		
				1 brass tack		
				4 nails		
LTU 9	overburden	5 clear		6 fence pieces		
				1 12-gage shell		
				1 piece iron		
LTU 10	overburden	3 clear	1 stoneware	1 piece iron		
West/LTU 10	overburden			1 1900 Liberty nickel		
LTU 11	overburden	2 clear		5 nails (2 or 3 wire)		
		1 brown		1 lead seal		
				1 1889 nickel		
				1 12-gage shell		
						7
LTU 12	overburden	1 clear		1 piece iron		
LTU 13/14	E Muck Ditch Feature 22			1 fence piece (wire)		
BHT 2				1 nail		13
BHT 2 Ext.	overburden	3 clear		1 fence staple		
				2 pieces iron		
				1 piece iron		2
S48.77 E157				61 can fragments		
S49.27 E159	40-50 cm			1 barbed wire		
S79.27 E161	overburden			1 .38 lead bullet		
				1 wire		
S42 E178	overburden			1 cut nail		
				1 nail		
S42 E181	overburden					

Historic artifact provenience summary continued

Provenience	Level	Glass	Ceramics	Metal	Miscellaneous	?
S53 E181 point plot	overburden			1 eye-hook wagon hardware		9
S54 E182 point plot	overburden			1 .22 brass shell		
S54 E184	overburden disturbed	1 green		1 nail 2 pieces iron		
S57 E184	Feature 23 roadbed	1 clear		2 nails 1 lead (bullet?) 3 pieces iron		
S60 E184	Feature 23 roadbed	1 clear				
S55 E187.35	Feature 23 roadbed			1 piece iron		
S72.5 E185	Stratum 4 plowed		1 whiteware			2
S73.5 E186	Stratum 4 plowed			1 piece iron		
S72 E212	Stratum 4 plowed	1 clear				2
Indirect Impact Zone				3 wire nails	1 brick	2
S64 E154	50-60 cm					1
S64 E154	60-70 cm					1
S59 E157	0-10 cm					2
S59 E157	10-20 cm					2
S59 E157	30-40 cm					3
S59 E157	40-50 cm					1
S39 E164	0-10 cm					1
S75 E168	20-30 cm			1 piece iron		
S65 E175	0-10 cm			10 pieces iron and wire		
S80 E175	0-10 cm		1 stoneware			
S83 E175	10-20 cm			1 wire nail 1 piece iron		
S83 E175	20-30 cm	1 clear				
S61 E179	0-10 cm			1 wire nail		
S63 E179	0-10 cm	1 clear				
S68 E179	0-10 cm			1 wire nail		
S68 E179	10-20 cm	2 clear				
S71 E179	0-10 cm	1 clear				
S71 E179	40-50 cm			1 wire nail		
S54 E181	0-10 cm			1 piece iron		
S54 E181	20-30 cm					5
S69 E184	0-10 cm			15 pieces iron		
S69 E184	20-30 cm			1 piece iron		
S69 E184	30-40 cm			1 piece iron		
S81 E209	0-10 cm Stratum 4 plowed 20-30 cm					4
S81 E222	Stratum 4 plowed					[illegible]

Historic artifact provenience summary continued

Provenience	Level	Glass	Ceramics	Metal	Miscellaneous	?
HB 9	backdirt			2 wire nails 1 coffin lid thumbscrew		
HB 10	surface	43 milk				
HB 13		5 clear		16 wire nails		
HB 42	grave fill			24 wire nails 5 coffin lid thumbscrews 5 flatheads 1 piece iron 1 flat lead (bullet?)		
HB66	grave fill			2 wire nails 1 coffin lid thumbscrew		
Feature 16	Stratum 4 midden				1 piece foam rubber	
Feature 18	pit					1
Feature 20	burned bone concentration			1 flat lead	1 piece foam rubber	
Feature 1	W Muck Ditch					1
Feature 2	overburden	2 clear		1 wire nail 1 12-gage shell 1 16-gage shell 1 chain 4 wire pieces 1 backhoe tooth 1 piece iron 1 piece brass		
Feature 22	E Muck Ditch			1 piece iron		
Feature 23	roadbed	1 clear vial		1 shackle & screen closing		
Surface		1 clear 3 brown	2 stoneware 1 annular ware	1 heavy wire 1 wagon part 10 wire nails 3 hogwire 5 coffin lid thumbscrews 1 brass button 1 .44 brass shell 12 pieces iron		3
E of levee		1 clear 2 green	1 whiteware	1 wire nail 1 piece lead 1 piece iron		
W of levee		9 brown 1 green	2 stoneware 1 pipe piece	1 eve socket hoe 7 pieces iron 2 nails 2 coffin lid thumbscrews		
TOTALS		138	16	409	3	78

APPENDIX VI
ABORIGINAL STRATIGRAPHY AND FEATURE SUMMARIES

1. Stratigraphic summary of 3LA97
2. Material collected in the midden sample transect in the indirect impact zone
3. Postmold dimensions
4. Postmold artifact contents
5. Aboriginal feature dimensions
6. Aboriginal feature artifact contents

1. Stratigraphic summary

Unit Designation	Location(s)	Description	Munsell Soil Color*		Maximum Observed Thickness (m)	Age Range Interpretation (All Dates A.D.)
Stratum 1	E-W Trench 3, Section 3, N-S Trench, TU 2,4,5	Sand	7.5 YR 4/4	Brown/Dark Brown	1.20	1927 flood deposit
2	N-S Trench 1	Clay	10 YR 3/3	Dark Brown	.06	1914-1927 flood deposit; same as Strata 9,18, H,I,J
3	N-S Trench 1	Sandy clay	7.5 YR 4/4	Brown/Dark Brown	.33	1730-1916
4	N-S Trench 1	Midden	7.5 YR 3/2	Dark Brown	.30	Caddo IV/V, 1670-1730; same as Strata 20 and 24
5	N-S Trench 1	Sandy clay	5 YR 3/4	Dark Reddish Brown	.30	Pre-1670
6	N-S Trench 1	Mixed sand	5 YR 4/4	Reddish Brown	.20	Pre-1670
7	N-S Trench 1	Sandy clay	5 YR 3/4	Dark Reddish Brown	.20	Pre-1670
8	N-S Trench 1	Sand	7.5 YR 4/6	Strong Brown	.28	Pre-1670
9	Test Unit 2	Clay	5 YR 3/3	Dark Reddish Brown	.06	1914-1927; same as Strata 2,18 H,I,J
10	Test Unit 2	Silt	7.5 YR 4/4	Brown/Dark Brown	.19	1914-1927
11	Test Unit 2	Silt/clay/sand	7.5 YR 4/4	Brown/Dark Brown	.14	Pre-1914
12	Test Unit 2	Clay/silt	5 YR 4/4	Reddish Brown	.15	Pre-1914
13	Test Unit 2	Clay	7.5 YR 4/6	Strong Brown	.04	Pre-1914
14	Test Unit 2	Clay silt	7.5 YR 3/4	Dark Brown	.21	Pre-1914
15	Test Unit 2	Sandy silt with clay	5 YR 4/6	Yellowish Red	.14	Pre-1914
16	Test Unit 2	Sand	7.5 YR 4/6	Strong Brown	.21	Pre-1914
17	Test Unit 2	Fine sand	7.5 YR 5/6	Strong Brown	.19	Pre-1914
18	Test Unit 5	Silty clay	**	Dark Brown	.04	1914-1927;same as Strata 2, 9, H, I, J
19	Test Unit 5	Sandy silt	**	Brown	.18	Pre-1914
20	Test Unit 5	Midden	7.5 YR 3.2	Dark Brown	.29	Caddo IV/V, 1670-1730; same as Strata 4 and 24
21	Test Unit 1	Sandy silt loam	5 YR 3/4	Dark Reddish Brown	.27	Pre-1670
22	Test Unit 1	Silty sand	5 YR 4/6	Yellowish Red	.23	Pre-1670
23	Test Unit 4	Sand	10 YR 4/3	Brown/Dark Brown	.30	1806-1927
24	Test Unit 4	Midden	7.5 YR 4/2	Brown/Dark Brown	.24	Caddo IV/V, 1670-1730; same as Strata 4 and 20
25	Test Unit 4	Sand	10 YR 4/3	Brown/Dark Brown	[illegible]	Pre-1670
26		Silty sand	5 YR 4/6	Yellowish Red	.25	Pre-1670
27	E-W Trench 3 Section 3	Sand	7.5 YR 4/6	Strong Brown	.16	1670-1927
28	E-W Trench 3 Section 3	Clay	7.5 YR 4/4	Brown/Dark Brown	.23	1670-1927
29	E-W Trench 3 Section 3	Sand	7.5 YR 4/6	Strong Brown	.31	1670-1927
30	E-W Trench 3 Section 3	Clay with midden lens	5 YR 3/3	Dark Reddish Brown	.55 (total) .05 (midden)	Caddo III, 1400-1500
31	E-W Trench 4	Sandy silt	7.5 YR 4/6	Brown/Dark Brown	.23	Pre-1670
[illegible]	Backhoe Tr. [illegible]	Sand with clay	7.5 YR 4/4	Brown/Dark Brown	.36	Pr[illegible] deposit, [illegible]
[illegible]	Backhoe Tr. [illegible]	Silt	7.5 YR 5/6	Strong Brown	.20	[illegible]
[illegible]	Backhoe Tr. 2	Clay with midden	7.5 YR 5/6	Yellowish Red	.60	Caddo IV/V, 1670-1730
[illegible]	Backhoe Tr. 3	Sand with midden	7.5 YR 5/6	Strong Brown	.30	Caddo IV/V, 1670-1730
36	Backhoe Tr. 3	Sand	7.5 YR 5/6	Strong Brown	.62	Pre-1670
[illegible]	Backhoe Tr. 3	Finely bedded sand with midden	7.5 YR 4/6	Strong Brown	.30	Caddo IV/V
[illegible]	Backhoe Tr. 3	Sand with midden	7.5 YR 4/4 Brown/Dark Brown to 7.5 YR 5/8 Strong Brown		.40	Caddo IV/V
39	Backhoe Tr. 3	Sand with midden	10 YR 4/4	Dark Yellowish Brown	.26	Caddo IV/V
[illegible]	Backhoe Tr. 3	Gumbo with midden	**	Brownish Red	.18	Caddo IV/V
[illegible]	Backhoe Tr. 3	Sand	**	Yellow Brown	.30	Pre-1670
A	E-W Trench 3, Section 3	Humus	**	Brown	.14	1927 +
B	E-W Trench 3, Section 3	Humus	**	Dark Brown	.10	1927 +
C	E-W Trench 3, Section 3	Sand	**	Light Brown	.20	1927 +? May be part of 1927 flood deposits
D	E-W Trench 3, Section 3	Humus	**	Dark Brown	.02	1927 +? May be part of 1927 flood deposits
E	E-W Trench 3, Section 3	Sand	**	Reddish Brown	.16	1927 +? May be part of 1927 flood deposits
F	E-W Trench 3, Section 3	Sand	**	Dark Brown	.09	1927 +? May be part of 1927 flood deposits
G	E-W Trench 3, Section 3	Sand	**	Reddish	.11	1927 +? May be part of 1927 flood deposits
H	E-W Trench 3, Section 3	Finely bedded sand	**	White	.30	1927 flood deposit; same as Strata 2,9,18, I,J
I	E-W Trench 3, Section 3	Finely bedded sand	**	White/Brown	.40	1927 flood deposit, same as Strata 1,9,18, H,J
J	E-W Trench 3, Section 3	Finely bedded sand	**	Tan/Brown	.48	1927 flood deposit; same as Strata 1,9,18,I,H

*Main matrix color (does not include mottling)
**Munsell reading not made

2. Midden sample transect in the Indirect Impact Zone (17 liter samples)

Grid Location	Relationship to Feature 3	Abcer (ct.)	Daub (gm.)	Cstone (ct.)	Flakes (gm.)	Floral (gm.)	Animal (gm.)	Fine Screen (gm.)
S141.4 E127	outside	-	9	-	1	1	2	-
S141.4 E130	within	6	123	-	-	-	1	3
S140.84 E138	outside ledge	6	20	-	5	-	-	-
S140.84 E142.5	outside	9	-	10	-	-	-	-
	Total:	21	152	10	6	1	3	3

Abcer=Aboriginal Ceramics
Cstone=Chipped Stone
Flakes=Flakes/Blocky Fragments/Shatter

3. **Postmold dimensions**

Postmold	Maximum Diameter(cm)	Maximum Depth(cm)	Volume(l)	Diameter/Depth Ratio
5	40	18.5	20	2.16
6	25.0	52.5	18	.48
7	20.0	23.0	24	.87
8	22.0	12.0	2	1.83
9	18.0	29 0	12	.62
10	18.0	14.0	20	1.29
11	27.0	10.0	16	2.70
12	23.0	8.0	4	2.88
13	21.0	43.0	16	.49
14	11.0	26.0	32	.42
15	13.0	26.0	32	.50
16	11.0	12.5	1	..88
17	23.0	10.0	2	2.30
18	20.0	14.0	8	1.43
19	20.0	37.0	12	.54
20	24.0	28.0	NR	.86
21	45.0	25.0	NR	1.80
22	16.0	22.0	2	.73
23	32.0	12.0	4	2.67
24	26.0	25.5	12	1.02
25	22.0	21.0	32	1.05
26	16.0	22.0	8	.73
27	11.0	30.0	2	.37
28	10.0	19.0	32	.53
29	26.0	35.0	14	.74
30	45.0	70.0	72	.64
31	23.0	20.0	3	1.15
32	23.0	32.0	8	.72
33	30.0	12.0	NC	2.50
34	14.0	15.0	NC	.93
35	12.0	15.0	NC	.80
36	22.5	31.0	NC	.73
37	16.0	10.0	1	1.60
38	10.0	11.0	4	.91
39	21.5	11.0	NC	1.95
40	18.0	28.0	NC	.64
41	18.0	35.0	NC	.51
42	11.0	11.0	NC	1.00
43	24.0	24.0	24	1.00
44	20.0	15.0	20	1.33
45	40.0	18.0	22	2.22
46	24.0	30.0	NC	.80
47	20.0	NE	NE	-
48	NR	NR	2	-
49	root		4	-
50	12.0	15.0	2	.80
51	11.0	29.0	4	.38
52	20.0	59.0	24	.34

3. **Postmold dimensions (continued)**

53	20.0	24.0	8	.83
54	28.0	30.0	NC	.93
55	10.0	19.0	NC	.53
56	18.0	56.0	NC	.32
57	30.0	64.0	NC	.47
58	22.0	19.0	NC	1.16
59	12.0	21.0	NC	.57
60	31.0	75.0	NC	.41
61	14.0	NE	NE	-
62	13.0	NE	NE	-
63	14.0	40.0	NC	.35
64	10.0	NE	NE	-
65	15.0	NE	NE	-
66	18.0	36.0	4	.50
67	14.-	NE	NE	-
68	15.0	NE	NE	-
69	20.0	52.0	NC	.38
70	14.0	NE	NE	-
71	14.0	NE	NE	-
72	40.0	NE	NE	-
73	12.0	35.0	4	.34
74	20.0	NE	NE	-
77	16.0	NE	NE	-
76	18.0	NE	NE	-
77	12.0	NE	NE	-
78	16.0	NE	NE	-
79	16.0	NE	NE	-
80	16.0	NE	NE	-
81	15.0	NE	NE	-
82	20.0	NE	NE	-
83	14.0	NE	NE	-
84	15.0	NE	NE	-
85	14.0	NE	NE	-
86	16.0	NE	NE	-
87	20.0	NE	NE	-
88	20.0	NE	NE	-
89	19.0	NE	NE	-
90	20.0	NE	NE	-
91	18.0	NE	NE	-
92	20.0	NE	NE	-
93	18.0	NE	NE	-
				-

Postmolds 1-4, summer 1980 (see Trubowitz 1980)
NR - not recorded
NE - not excavated

4. Postmold artifact contents

Postmold PM A	Flotation volume (½ of PM) B	[illegible] Ct	[illegible] Wt	[illegible] Ct	[illegible] Ct	[illegible] Wt	[illegible] Wt	[illegible] Wt	[illegible] Wt	[illegible] Wt
5	10	4	22			1			1	
6	14	18	2	2		25	41	1	37.5	38
7	12	3	1			1		1	1	12
8	1						9			1
9	6	1	1							2
10	10							1		2
11	8	2	1						1	10
12	2									1
13	8									10
14	16									3
15	16	2	9						1	40
16	5									3
17	1					13				4
18	4				1				1	34
19	6	10	2	1		15			1	14
20	NR									2
21	NR	3								
22	1	4	1			1			17	6
23	2	1	3			2			1	2
24	6	5	1			1			3	7
25	16	2		2		8		1	3	12
26	4		2							2
27	1					1			1	2
28	16									4
29	7	7				13			1	10
30	36	11	1	3		11		2	7	61
31	2									2
32	4									8
33	NC					1				
36	NC	2								
37	1		1							3
38	2									1
42	NC	1								
43	12	2				4			1	16
44	10									3
45	11	1	398					1		1722
46	NC	1								
47	NC	2								
48	1		1							2
49	2									2
50	1									1
51	2	1								
52	12									1
53	4			1						2
54	NC	1								2
58	NC	1								
66	2									
73	2		4			2				1
79	NC	3	2							5
							1		2	33
TOTALS		88	452	9	1	99	42	7	79.5	208[illegible]

Postmolds 1-4 - summer 1980 testing (see Trubowitz 1980)
Postmolds 39-41, 55-57, 59-65, 67-68, 70, 72, 74-78, 80-93 - no collections made
Postmold 71 is part of Feature 18 (see Table 9-3)
NC - not collected
NR - not recorded

Abcer=Aboriginal Ceramics
Cstone=Chipped Stone
Gstone=Ground/Polished Stone
Flake=Flakes/Blocky Fragments/Shatter
Lithic=Miscellaneous Lithic

5. **Aboriginal feature dimensions**

Feature	Designation	Diameter (cm)	Depth (cm)	Volume (liter)	Diameter/depth ratio
3	Caddo Structure 1	960	NA	NA	NA
4	canine burial	70	9	17	7.78
5	pit	32	35	NC	.91
6	pit	30	NR	48	U
7	pit	40	10	88	4.00
9	pit	46.2	9	16	5.13
10	canine burial	54	NR	4	U
11	animal bone cache	40	17.5	47	2.29
12	pit	35.3	14.5	10	2.43
13	pit	57	20	32	2.05
14	floor depression	90	10	7	9.00
15	floor depression	85	18	42	4.72
16	floor depression	140	NR	12	U
17	bell-shaped pit	75	50	NR	1.50
18	thermally altered pit	157	50	328.5	3.14
19	floor depression	54	NR	14	U
20	burned bone concentration	100	NR	NR	U
21	stain--floor depression		NR	NC	U
24	Caddo Structure 2	U	NA	U	NA
25	Caddo Structure 3	U	NA	U	NA

U - unknown; NA - not applicable; NC - not collected; NR - not recorded

6. Aboriginal feature artifact contents

Fea. No.	Fea. Designation	Flotation Volume (l)	Abcer (ct.)	Daub (cwt.)	Cstone (ct.)	Gstone (ct.)	Flake (wt.)	Lithic (wt.)	Floral (wt.)	Animal (wt.)	Embedded Fine Screen (wt.)	[illegible] (ct./wt.)
			Artifacts									
3	Caddo Structure	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	
4	Canine Burial	17	1	--	--	--	--	--	--	90	8	
5	Pit	N.C.	2	--	--	--	--	--	--	2	--	
6	Pit	24	4	--	1	--	6	--	1	1	68	
7	Pit	44	2	--	--	--	6	--	--	1	4	
9	Pit	8	9	2	--	--	25	--	1	2	19	
10	Canine Burial	2	--	--	--	--	--	--	--	76	23	
11-б	Animal Bone Cache	47	6	3601	--	--	3	2	4	309	6048	
12	Pit	5	--	--	--	--	--	--	--	--	99	
13-б	Pit	16	27	--	--	--	12	--	--	80	84	
14*	Floor depression	42	7	379	1	--	9	301	2	3	1675	
15*	Floor depression	21	4	479	1	--	6	--	--	144	210	
16	Floor depression	6	26	1	--	--	7	--	--	7	8	
17*	Bell Shaped Pit	N.R.	116	4626	1	1	151	128	3	60	--	
18*	Thermally altered pit	219	66	7982	7	--	58	221	11	148	11584	
19	Floor depression	141	--	17	--	--	--	--	--	4	46	
20	Burned Bone Concentration	171	24	12	1	--	5	1	--	33	135	
21Δ	Floor depression ?	N.C.	4	--	--	--	--	--	--	32	--	
24	Caddo Structure 2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	
25	Caddo Structure 3	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	
			298	17,099	12	1	288	652	22	992	20,011	

N.C. = Not Collected
N.R. = Not Recorded
N.A. = Not Applicable
* = within Fea. 3 Δ = within Fea. 24 б = within Fea. 25
Abcer = Aboriginal Ceramics
Cstone = Chipped Stone
Gstone = Ground/Polished Stone
Flake = Flakes/Blocky Fragments/Shatter
Lithic = Miscellaneous Lithic

APPENDIX VII
BURIAL ARTIFACT COUNT AND DESCRIPTION OF BURIAL 16

1. Rough sort of materials recovered from aboriginal burials
2. Aboriginal burial traits
3. Description of Burial 16

1. Rough sort of materials recovered from aboriginal burials

Burial	#	Abcer (ct.)*	Daub (ct.)	Cstone (ct.)	Gstone (ct.)	Flake (g.)	Lithic (g.)	Flora (g.)	Animal (g.)	Fine Screen (g.)	Soil Samples (ct.)	C14 Samples (ct.)	Grave Fill Flotation Volume (l.)	Grave Fill Unfloted Volume
Burial	1	6	2	--	--	6	--	--	18	67	3	--	40	--
(non-human)	2	5	2	--	--	--	--	--	102	430	1	--	34	--
	3	144	31	8	--	39	1	2	217.7	50.1	6	--	102	--
	4	23	1	1	--	12	--	--	224.7	64.2	7	1	378	--
	5	16	9	--	--	4.2	--	0.7	104.9	51.7	6	--	138	--
	6	36	19	1	--	6	1	--	61.7	8.0	1	--	40	40
	7	16	9	1	--	5	--	--	451.9	53.6	10	--	238	--
	8	6	1	--	--	--	--	--	86.5	38	9	1	765	2
	9	33	--	2	--	9	--	--	154	150.2	14	1	375	--
	10	13	1	--	--	5	4	--	270	77	11	1	442	--
	11	26	--	--	--	--	--	1.0	16	133	2	--	110	--
	12	25	--	2	--	--	--	--	17	47	7	1	71	--
	13	3	13	--	--	4	--	--	3	48	1	--	14	--
	14	38	--	1	--	1.1	--	--	179.3	4.4	11	1	N.R.	--
	15	2	3	--	--	2	--	--	18.9	66.1	3	1	15	28
Totals		428	91	15	--	93.3	6	3.7	1925.6	43,858.3	92	7	2760	70

*Whole pots count as only 1 aboriginal ceramic
N.R.=Not Recorded, provenience tag missing
Abcer=Aboriginal Ceramics
Cstone=Chipped Stone
Gstone=Ground/Polished Stone
Flake=Flakes/Blocky Fragments/Shatter
Lithic=Miscellaneous Lithic

2. **Aboriginal burial traits**

		SPATIAL ARRANGEMENT OF ARTIFACTS															POTTERY VESSELS			
Burial #	Group	Bone points	Lithic points	Necklace shell beads	Shell ear dec.	Lithic flake	Fish offering	Conch shell	Mussel shell	Pigment	Pottem pipe	Bone tools	Animal rodent bones	Shell bracelet	Clay ball	Bone buttons	Bottle	Bowl	Jar	Effigy
1	B								X								X	X	X	X
nonhuman 2																				
3	C			X					X								X	X		
4	C			X	X									X			X	X	X	
5	C			X													X	X	X	
6	C				X															
7	C	X		X				X	X	X					X			X	X	
8	E								X			X	X			X	X	X	X	
9	C				X		XX		X	?					X		X	X	X	
																		X	X	
10	C	X		X			X		X	?					X		X	X	X	
11	D																X	X	X	
12	D	X	X						X				X					X	X	
13	A																			
14	E		X			X					X	X			X		X	X	X	
15	A																X		X	

DESCRIPTION OF BURIAL 16

This child, 3 (± 1) years of age, was recovered during excavation of the historic cemetery during the 1982 field season. This burial is represented by a fragmented 50% complete cranium and a fragmented 75% complete postcranial skeleton: thoracic and lumbar vertebrae, ribs, humeri, tibia, and left fibula. The left tibia exhibits active periostitis which indicates a localized bacterial infection. The most remarkable pathology is the 14 caries found on the 16 deciduous teeth. This high rate for such a young individual suggests extensive developmental disturbance of dental development indicating severe childhood stress.

APPENDIX VIII
DISTRIBUTION OF CERAMICS ACROSS THE CEDAR GROVE SITE AND THE CERAMICS FROM THE CEDAR GROVE 1 COMPONENT

Distribution of ceramics across the Cedar Grove site

BELCHER, NATCH/HODGES	LTU2 FEA 1-3			LT0			LT1			LT2			LT3			LT4			LT5			LT6			LT7		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
BELCHER ENG VAR OWEN OR BELCHER OR NAT ENG VAR LESTER BEND BOTTOMLESS RIM				2		3		1	3		1	3		1	7	1		4		1	2			1		1	1
BELCHER ENG VAR OWEN OR NAT ENG VAR LESTER BEND SHOULDER SHERDS W/INTERIOR LINE-NOT ENOUGH BODY TO TELL PLAIN					1			1	5		1			2			2										
BELCHER ENG VAR OWEN OR BELCHER RIM/BODY SHERDS W/O INTERIOR LINE																1	1	2									
BELCHER ENG VAR OWEN RIM/BODY SHERDS W/ INTERIOR LINES					1										1		1										
BELCHER RIDGED BASE SHERDS																											
BELCHER RIDGED VAR WILSON'S ISLAND RIM/BODY SHERDS																											
BELCHER ENG VAR OWEN OR BELCHER SHOULDER SHERDS WITHOUT INTERIOR LINE						1			3			1		1				2									
NATCHITOCHES ENG VAR LESTER BEND SHOULDER/BODY SHERD									1			1			2												
BELCHER ENGRAVED BOTTLE BODY SHERDS VAR UNDETERMINABLE												1									2						
BELCHER RIDGED BODY SHERDS	7			1	2	2	3		3	2	4	2	3	1	3	3	2	4	2	1	2						
NATCH/HODGES BOWLS OR BODY SHERDS																											
X HATCHING/BALL															1												
ZONED X HATCHING															3			1		1	3				1		
X HATCHING/TICKED LINE																		1									
ZONED HATCHING									1			1															
NATCH/HODGES BOTTLE BODY SHERDS																											
ZONED X HATCHING						1			1			1					1	1		1	3						
X HATCHING W/BALL									1											1		1					
X HATCHING TICKED LINE								1													1						
ZONED HATCHING																											1

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

BELCHER, NATCH/HODGES

	LT8			LT9			LT10			LT11			LT12			LT13/14			FEA10			FEA13		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
BELCHER ENG VAR OWEN OR BELCHER OR NAT ENG VAR LESTER BEND BOTTOMLESS RIM			3			2			1						2		3	3						
BELCHER ENG VAR OWEN OR NAT ENG VAR LESTER BEND SHOULDER SHERDS W/INTERIOR LINE-NOT ENOUGH BODY TO TELL PLAIN				1	1			1									2	3						
BELCHER ENG VAR OWEN OR BELCHER RIM/BODY SHERDS W/O INTERIOR LINE																		1						
BELCHER ENG VAR OWEN RIM/BODY SHERDS W/ INTERIOR LINES			1														1	1						
BELCHER RIDGED BASE SHERDS													1											
BELCHER RIDGED VAR WILSON'S ISLAND RIM/BODY SHERDS					1																			
BELCHER ENG VAR OWEN OR BELCHER SHOULDER SHERDS WITHOUT INTERIOR LINE						1			1															
NATCHITOCHES ENG VAR LESTER BEND SHOULDER/BODY SHERD	1					1			1			1			2		2							
BELCHER ENGRAVED BOTTLE BODY SHERDS VAR UNDETERMINABLE									1		1	2					1	1						
BELCHER RIDGED BODY SHERDS	5	2	1	5	2	4	6	1	2	8	9	2	1	7	1	7	2	1						
NATCH/HODGES BOWLS OR BODY SHERDS X HATCHING/BALL																								
ZONED X HATCHING	1		1			1			1									1						
X HATCHING/TICKED LINE																								
ZONED HATCHING													1					1						
NATCH/HODGES BOTTLE BODY SHERDS ZONED X HATCHING			1				1		2									3						
X HATCHING W/BALL									1								1							
X HATCHING TICKED LINE									1															
ZONED HATCHING																		1						

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

BELCHER, NATCH/HODGES

	FEA18			FEA20			FEA17			FEA21			TOTAL		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
BELCHER ENG VAR OWEN OR BELCHER OR NAT ENG VAR LESTER BEND BOTTOMLESS RIM			1										3	8	36
BELCHER ENG VAR OWEN OR NAT ENG VAR LESTER BEND SHOULDER SHERDS W/INTERIOR LINE-NOT ENOUGH BODY TO TELL PLAIN													1	11	8
BELCHER ENG VAR OWEN OR BELCHER RIM/BODY SHERDS W/O INTERIOR LINE						1							1	1	4
BELCHER ENG VAR OWEN RIM/BODY SHERDS W/ INTERIOR LINES														3	3
BELCHER RIDGED BASE SHERDS													1		
BELCHER RIDGED VAR WILSON'S ISLAND RIM/BODY SHERDS														1	
BELCHER ENG VAR OWEN OR BELCHER SHOULDER SHERDS WITHOUT INTERIOR LINE														1	9
NATCHITOCHES ENG VAR LESTER BEND SHOULDER/BODY SHERD													1	2	9
BELCHER ENGRAVED BOTTLE BODY SHERDS VAR UNDETERMINABLE		1												3	7
BELCHER RIDGED BODY SHERDS	4						1						58	33	28
NATCH/HODGES BOWLS OR BODY SHERDS															
X HATCHING/BALL															1
ZONED X HATCHING													2	1	11
X HATCHING/TICKED LINE															1
ZONED HATCHING												1	1		4
NATCH/HODGES BOTTLE BODY SHERDS															
ZONED X HATCHING													1	2	13
X HATCHING W/BALL														3	2
X HATCHING TICKED LINE														1	2
ZONED HATCHING															2
TOTAL													69	70	[illegible]

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

FOSTER	LT0			LT1			LT2			LT3			LT4			LT5			LT6			LT7			LT8			LT9		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
UNZONED, PUNCTATED, BOTTOMLESS, TOPLESS FOSTER RIMS																														
UNZONED INCISED FOSTER RIMS W/LIP BOTTOMLESS	1																		1											
PUNCTATED FOSTER RIMS W/LIPS BOTTOMLESS, UNZONED													1															1		
FOSTER NODES (4 NODES)							1																							
FOSTER NODES FLATTENED NODES	1									2			2															1		
FOSTER TRAILED INCISED NIPPLE NODES		1																												
FOSTER BOTTOMLESS INCISED RIMS TOO SMALL TO TELL IF ZONED OR UNZONED	2			1			3									1												2		
UNZONED TOPLESS/BOTTOMLESS TOOL PUNCTATED FOSTER RIMS	4			2									2			2			4						2			4		
ZONED INCISED TOPLESS AND BOTTOMLESS RIMS-FOSTER OR RED LAKE			1																											
FOSTER RIM BODY-PUNCTATED RIM TRAILED BODY=VAR. MOORE																														
SMALL PUNCTATED RIMS-BOTTOMLESS POSSIBLY CHILDMADE FOSTER																1				1										
BANDED INCISED, BOTTOMLESS TOPLESS RIMS COULD BE FROM FOSTER VAR. REDLAKE OR FOSTER													1																	1
FOSTER RIM/BODY SHERD UNZONED INCISED RIM-TRAILED INCISED BODY VAR. DIXON																														
FOSTER RIM/BODY SHERDS-RIMS ARE INCISED BUT ALL ARE TOO SMALL TO TELL IF ZONED OR UNZONED, BODIES ARE TRAILED INCISED										1																				
FOSTER TRAILED INCISED VAR. SHAW PARTIAL VESSEL	1																													

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

FOSTER	LT10 S	LT10 G	LT10 NVT	LT11 S	LT11 G	LT11 NVT	LT12 S	LT12 G	LT12 NVT	LT13/14 S	LT13/14 G	LT13/14 NVT	FEA 18 S	FEA 18 G	FEA 18 NVT	FEA 20 S	FEA 20 G	FEA 20 NVT	TOTAL S	TOTAL G	TOTAL NVT
UNZONED, PUNCTATED, BOTTOMLESS, TOPLESS FOSTER RIMS											1									1	
UNZONED INCISED FOSTER RIMS W/LIP BOTTOMLESS	1	1		1						2									6	1	
PUNCTATED FOSTER RIMS W/LIPS BOTTOMLESS, UNZONED	1													1					3	1	
FOSTER NODES (4 NODES)	1																		2		
FOSTER NODES FLATTENED NODES	2									2									10		
FOSTER TRAILED INCISED NIPPLE NODES				1															1	1	
FOSTER BOTTOMLESS INCISED RIMS TOO SMALL TO TELL IF ZONED OR UNZONED											1								9	1	
UNZONED TOPLESS/BOTTOMLESS TOOL PUNCTATED FOSTER RIMS	6			1			1			6									34		
ZONED INCISED TOPLESS AND BOTTOMLESS RIMS-FOSTER OR RED LAKE																					
FOSTER RIM BODY-PUNCTATED RIM TRAILED BODY=VAR. MOORE									1												1
SMALL PUNCTATED RIMS-BOTTOMLESS POSSIBLY CHILDMADE FOSTER	1	2		1		1	1			3		1							7	3	2
BANDED INCISED, BOTTOMLESS TOPLESS RIMS COULD BE FROM FOSTER VAR. REDLAKE OR FOSTER															1	1			2	2	
FOSTER RIM/BODY SHERD UNZONED INCISED RIM-TRAILED INCISED BODY VAR. DIXON				1															1		
FOSTER RIM/BODY SHERDS-RIMS ARE INCISED BUT ALL ARE TOO SMALL TO TELL IF ZONED OR UNZONED, BODIES ARE TRAILED INCISED																			1		
FOSTER TRAILED INCISED VAR. SHAW PARTIAL VESSEL																			1		
TOTAL																			77	10	3

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

	LT0			LT1			LT2			LT3			LT4			LT5			LT6			LT7			[illegible]		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	N
NATCH/HODGES BOWL BOTTOM SHERDS			1																								
X HATCHING/TICKED LINE/BALL											1																
X HATCHING/TICKED LINE			1									3		1	3												
X HATCHING/BALL			1			2			1																		
ZONED X HATCHING									1		1	1															
HATCHING/BALL												1															
ZONED HATCHING																											
HATCHING/TICKED LINE/BALL																											
HATCHING/TICKED LINE																											
CURVILINEAR TICKED LINE PARTS OF INTERLOCKING SCROLLS																											
BELCHER ENG BOTTLE BODY SHERDS VAR OADEN																										1	
HODGES ENG BOTTLE NECK AND BODY SHERD VAR UNDETERMINABLE																											
NATCHITOCHES ENG VAR NATCHITOCHES HELMET SHAPED BOWLS W/BAND-ALL ARE RIM BODY OR SHOULDER BODY SHERDS						1			1			3			1											1	
KENO TRAILED VAR PHILLIPS RIM BODY SHERDS																											
KENO TRAILED BODY SHERDS	4	3	11	2	2	7	2	2	9	2	2	20			3		1	4	2		4		1	2	3	3	
MULTIPLE LINE SHERDS-PROB BELCHER BOTTLES			1						2																		
AVERY ENG VAR UNDETERMINABLE-ALL ARE SHOULDER SHERDS												1															
AVERY ENG. VAR GRAVES RIM SHERD											1																
AVERY ENG VAR BRADSHAW													1														

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

	LT9			LT10			LT11			LT12			LT13/14			FEA13			FEA16			FEA21			TOTAL		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	N
NATCH/HODGES BOWL BOTTOM SHERDS																											
X HATCHING/TICKED LINE/BALL																										1	
X HATCHING/TICKED LINE															2											1	
X HATCHING/BALL																											
ZONED X HATCHING			1			1																				1	
HATCHING/BALL			1		1				1						1											1	
ZONED HATCHING						1																1			1		
HATCHING/TICKED LINE/BALL						2																					
HATCHING/TICKED LINE			1	1			1																		2		
CURVILINEAR TICKED LINE PARTS OF INTERLOCKING SCROLLS			1						1																		
BELCHER ENG BOTTLE BODY SHERDS VAR OADEN																										1	
HODGES ENG BOTTLE NECK AND BODY SHERD VAR UNDETERMINABLE																					1						
NATCHITOCHES ENG VAR NATCHITOCHES HELMET SHAPED BOWLS W/BAND-ALL ARE RIM BODY OR SHOULDER BODY SHERDS	1								1						1										1	1	
KENO TRAILED VAR PHILLIPS RIM BODY SHERDS															1												
KENO TRAILED BODY SHERDS	1	1	3	1	2	7	8		9			6	2		9										27	16	
MULTIPLE LINE SHERDS-PROB BELCHER BOTTLES					1	7			1			1														1	
AVERY ENG VAR UNDETERMINABLE-ALL ARE SHOULDER SHERDS															1												
AVERY ENG. VAR GRAVES RIM SHERD																										1	
AVERY ENG VAR BRADSHAW																									1		
TOTAL																									32	[illegible]	1

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

Distribution of ceramics across the Cedar Grove site

	LT0			LT1			LT2			LT3			LT4			LT5			LT6			LT7			LT8		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
CHANGES OF EL CAMINO																											
EL CAMINO 3													1														
ESTHER 1 OR 2			1												1												
ESTHER 1 OR 2 OR EL CAMINO 1 OR 2																											
ESTHER 1															1												
ESTHER 2												1															1
EL CAMINO 1, 2, OR 3			1		1									1							1						
ESTHER 2 OR EL CAMINO 3																							2				

	LT9			LT10			LT11			LT12			LT13/14			TOTAL		
	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT	S	G	NVT
CHANGES OF EL CAMINO																		
EL CAMINO 3												1				1		1
ESTHER 1 OR 2									1									3
ESTHER 1 OR 2 OR EL CAMINO 1 OR 2									1									1
ESTHER 1			2															3
ESTHER 2			1						1						1			5
EL CAMINO 1, 2, OR 3			1					1	1			1					3	5
ESTHER 2 OR EL CAMINO 3																	2	
TOTAL																1	5	18

Abbreviations: LTU: Levee Transect Unit; FEA: Feature; LT: Levee Transect; S: Shell; G: Grog; NVT: No Visible Temper

THE CERAMICS FROM THE CEDAR GROVE 1 COMPONENT

Frank F. Schambach and John E. Miller

As we state in our chapter on the Caddo IV and V ceramics, 126 sherds from a stratigraphically earlier Caddo midden located southeast of the main midden area were also submitted to us for identification and analysis.

This is the same midden that produced the very small collection of 12 sherds upon which the "Component 1" of our preliminary report is based (Schambach et al. 1980:143-144). That collection was characterized by an absence of shell temper, a high frequency of bone temper, (9 of the 12 sherds) and a brushed, grog-tempered coarse ware sherd. The only identifiable types were one sherd each of Foster Trailed-Incised and Belcher Engraved. Mainly on the basis of the bone temper and the brushing, we concluded that "There is about an 80% probability that this sample represents a distinct early component dating to about A.D. 1500." We guessed that it represented a very early Belcher phase occupation.

The present collection amply confirms the presence of a distinct early component. Shell temper is absent. Bone temper now occurs in a more realistic 28% of the collection. Grog temper predominates. The slightly expanded list of diagnostic types now includes Glassell Engraved and Pease Brushed-Incised. Bossier Brushed and Sinner Linear-Punctated may be present.

Without more contextual data all we can say is this material looks like it could represent a single component. The general run of types is similar to what we see in our large surface collections from certain areas around Battle Mound. It probably falls within the period A.D. 1400 to 1500. The mixture of Belcher and Bossier phase types suggests that further excavations could help clarify the now very hazy matter of Belcher phase-Bossier phase relationships.

Ceramics from the Cedar Grove 1 component		
Type or Descriptive Category	Number	Temper
Classell Engraved (bottle)	1	Grog
Pease Brushed-Incised	6	Grog
Washington Stamped	7	Grog
	6	Bone
Linear punctated coarse ware	1	Grog
Trailed-incised	1	Grog
Compound brushed coarse ware	2	Grog
	4	Bone
Simple brushed coarse ware	5	Grog
	3	Bone
Horizontally incised rim coarse ware	1	Grog
Punctated-incised rim/body coarse ware	1	Bone
Untypable engraved fine ware bowl fragments	3	Grog
Untypable engraved fine ware bottle or carafe fragments	3	Grog
Plain coarse ware rims	2	Grog
Plain coarse ware bodies	31	Grog
	11	Bone
Unclassifiable decorated rims (too eroded to type)	1	Grog
Unclassifiable decorated bodies (too eroded to type)	17	Grog
	8	Bone
Totals	126 Grog 91	Bone 35

APPENDIX IX
PLANT REMAINS FROM CEDAR GROVE

1. Plant remains from human burials
2. Plant remains from features
3. Plant remains from midden
4. Plant remains from postmolds
5. Plant remains from column samples
6. Plant remains from excavation units

1. Plant remains from Cedar Grove human burials.

Provenience	Type Remains	Wt.(G)	No.	Remarks
597 B01	charcoal	0.1		
600 B02	charcoal	0.5		
839 B03	charcoal	0.1		
840 B04/S62 E175	charcoal	0.1		
722 B05/S70 E169	charcoal	0.3		
1140 B07	charcoal	0.2		
963 B08	rubus		1	carbonized
1168 B09	0			
1167 B09	0			
1178 B09	0			
1159 B10	charcoal	0.1		
1128 B10	charcoal	0.1		
1127 B10	charcoal	0.1		
931 B11	0			
950 B11 HB9	charcoal	0.1		
1041 B12	0			
123[illegible] B12	charcoal	0.1		
101[illegible] B13	0			
1378 B15	charcoal	0.1		
	zea mays		3	cupules (3.2 & 3.3 mm wide)
1302 B1[illegible]	zea mays	0.1	1	cupule fragment
	charcoal	0.1		

2. Plant remains from Cedar Grove features.

Provenience		Type Remains	Wt.(G)	No.	Remarks
631	F06	0			
		carya	0.1		
630	F07	carya	0.1		
628	F09	carya	0.3		
692	F10	cf. ipomoea		1	carbonized
675	F11/LTU 3	charcoal	1.5		
)		zea mays	0.2	10	cupule fragments (3.5 mm
		diospyros virginiana		1	carbonized
		arundinaria gigantea	0.5		
		charcoal	0.1		arundinaria
		charcoal	0.1		
734	F12	0			
683	F13/LTU 2	zea mays	0.1		cupule fragments
		charcoal	0.1		
1005	F14/S141 E130	diospyros virginiana		1	carbonized
		quercus		1	carbonized acorn
		zea mays	0.1	1	cupule
1108	F16	charcoal	0.8		
		zea mays	(.1		cupule fragments
1547	F17	quercus	0.2		
1387	F17	arundinaria gigantea	5.0		
1547	F17/S144 E130	charcoal	0.2		
1381	F18	carya	0.3		
1401	F18	charcoal	0.3		
1381	F18	carya illinoensis	0.3		
1401	F18	zea mays	0.2		cupule fragment (5.0 mm wide)
		zea mays	0.1	1	cupule fragment
		charcoal	0.1		
1381	F18	zea mays		3	cob and kernel fragments
1452	F18	arundinaria gigantea	0.5		
1381	F18	charcoal	0.5		
1452	F18	charcoal	0.1		
1381	F18	quercus	0.1		
1452	F18	carya	0.1		
		diospyros virginiana		3	carbonized
		charcoal	0.1		
1381	F18	cf. ipomoea		1	carbonized
& 4.2 mm wide)		zea mays	1.0		kernel and cupule fragments
2.9 mm)		iva annua		1	carbonized seed (=uncarb. achene)
1401	F18	carya illinoensis	0.2		
		arundinaria gigantea	0.6		
1382	F18/PM71	zea mays		1	cob fragment
		charcoal	0.3		
1379	F18/PM71	arundinaria gigantea	0.3		
		charcoal	0.2		
1004	F19/S141 E130	charcoal	0.1		
1105	F20	0			
1082	F20	charcoal	0.1		
		zea mays	0.1		cupule fragments

3. Plant remains from Cedar Grove midden samples.

Provenience		Type Remains	Wt.(G)	No.	Remarks
532	B/levee & ws	charcoal	0.8		
		charcoal	0.6		acer
680	LTU 0	zea mays		2	cupule fragments
		charcoal	0.1		
677	LTU 01	charcoal	0.1		
		carya	1.1		
141	LTU 02	charcoal	0.1		
		0			
549	LTU 03	diospyros virginiana		1	carbonized
671	LTU 04	carya	0.1		
		charcoal	0.1		
742	LTU 05	charcoal	0.1		
591	LTU 05	charcoal	0.1		
504	LTU 05	0			
648	LTU 06	carya	0.1		
		charcoal	0.2		
121	LTU 06	zea mays		6	cob fragments
		charcoal	0.2		
226	LTU 08	charcoal	0.1		ulmaceae
737	LTU 08	charcoal	0.1		
226	LTU 08	charcoal	0.2		taxodium/ulmaceae
741	LTU 09	charcoal	0.1		
		charcoal	0.1		
112	LTU 09	carya	0.1		
		charcoal	0.4		fraxinus
		0			
746	LTU 10	charcoal	0.1		
743	LTU 10	charcoal	0.2		arundinaria
320	LTU 10	charcoal	0.6		quercu
		charcoal	0.1		taxodium
736	LTU 11	0			
86	LTU 11	0			
32	LTU 11	charcoal	5.8		taxodium/morus
31	LTU 12	charcoal	9.5		taxodium
		0			
26	LTU 12	zea mays	0.8		cupule fragments
		charcoal	0.8		
31	LTU 12	carya	0.3		thick-walled
26	LTU 12	corylus americana	0.4		
27	LTU 12 10-20	charcoal	0.1		
28	LTU 12 20-30	carya	0.2		thick-walled
		charcoal	0.3		
29	LTU 12 40-50	charcoal	2.4		
		carya	0.2		thick-walled
		charcoal	2.4		
433	S of LTU 12	charcoal	0.3		platanus
		nelumbo lutea		3	carbonized seed fragments
		carya illinoensis	0.1		
		charcoal	4.1		quercus/salicaceae
920	S138 E130	charcoal	0.2		
921	S141 E130	charcoal	43.7		diospyros/platanus/ulmaceae
1026	S141.4 E127	carya	0.2		
337	S42 E178	charcoal	1.6		
		charcoal	7.4		carya
69	S54 E184	charcoal	0.1		acer
70	S54 E184	charcoal	0.1		
65	S56 E187.35	000			neither plant nor carbonized
553	S72.5 E185	carya	0.5		
		charcoal	1.5		pinus
376	S75.5 E188	166-001-002		1	carbonized seed fragment
		carya	0.2		
		zea mays		1	cupule
		carya illinoensis	0.2		
		diospyros virginiana		1	half carbonized seed
372	S75.5 E188	carya	0.1		
		charcoal	0.2		
333	S79.27 E161	charcoal	0.1		
538	W levee	charcoal	0.1		
537	W of LT	charcoal	0.5		

4. Plant remains from Cedar Grove postmolds.

Provenience		Type Remains	Wt.(G)	No.	Remarks
1036	PM 05	charcoal	0.1		
913	PM 06	charcoal	0.2		hickory
914	PM 06	0			
747	PM 07	zea mays	0.1		cupule fragments
		carva	0.2		
639	PM 08	0			
638	PM 09	0			
637	PM 10	0			
640	PM 11	charcoal	0.1		
635	PM 13	0			
636	PM 14	0			
629	PM 15	0			
627	PM 16	charcoal	0.1		
626	PM 17	0			
624	PM 19	cf. *ipomoea*		1	carbonized
		charcoal	0.1		
644	PM 23	charcoal	0.1		
645	PM 24	charcoal	0.1		
649	PM 25	charcoal	0.1		
		charcoal	0.1		
650	PM 26	charcoal	0.1		
651	PM 27	charcoal	0.1		
652	PM 28	charcoal	0.1		
653	PM 29	charcoal	0.1		
905	PM 30	charcoal	0.4		diffuse porous
654	PM 30	charcoal	0.1		
		charcoal	0.3		
		carva	0.1		
655	PM 31	charcoal	0.1		
656	PM 32	charcoal	0.1		
449	PM 37	0			
733	PM 38	charcoal	0.1		
938	PM 41	charcoal	0.1		
1076	PM 43	charcoal	0.1		
		charcoal	0.1		arundinaria
1081	PM 44	charcoal	0.1		
1037	PM 45	charcoal	0.1		
		charcoal	0.2		arundinaria
1111	PM 48	charcoal	0.1		
1113	PM 49	charcoal	0.1		
		carva	0.1		
1115	PM 50	charcoal	0.1		
1119	PM 52	charcoal	0.1		
		charcoal	0.1		arundinaria
1121	PM 53	charcoal	0.1		
		cucurbita pepo		1	rind fragment
1390	PM 66	zea mays		1	kernel fragment
1390	PM 66	charcoal	0.1		
1392	PM 69	charcoal	0.1		
1397	PM 73	0			

5. Plant remains from Cedar Grove column samples.

	Provenience	Type Remains	Wt.(G)	No.	Remarks
76	57.5 E183.5	charcoal	0.6		
75	62.5 E184	charcoal	0.1		
55	72.5 E212	0			
56	72.5 E212	0			
60	72.5 E212	0			
555	73.5 E186	charcoal	0.1		
113	HTU 9 0-10	charcoal	0.1		cf. salicaceae
144	LTU 2 0-10	charcoal	0.1		
236	LTU 5 0-10	lagenaria siceraria		1	possible button fragment
117	LTU 6 10-20	zea mays		6	cob fragments and cupules
118	LTU 6 20-30	charcoal	0.1		cypress
114	LTU 9 10-20	charcoal	0.1		
928	S139.5 E 32	charcoal	1.0		
1027	S140.5 E1[illegible]	0			
1025	S141 E123.7[illegible]	charcoal	0.1		
926	S141 E131.5	charcoal	0.1		
1008	S144 E130	charcoal	1.0		
1001	S147.1 E131.4	0			
522	S38 E181	charcoal	1.3		
		carya	0.1		
338	S42.5 E179.5 0-10	charcoal	0.3		
339	S42.5 E179.5 10-20	charcoal	1.0		hickory
68	S48.77 E157	charcoal	0.5		
		zea mays	0.1		cupule fragment
123	S49.27 E159 10-20	charcoal	0.4		ulmaceae
124	S49.27 E159 20-30	charcoal	0.1		
		charcoal	0.5		
125	S49.27 E159 30-40	rhus sp		1	carbonized
		999	0.2		
126	S49.27 E159 40-50	vitis		1	carbonized
		charcoal	0.2		
		carva	0.1		
130	S49.27 E159 50-60	zea mays	0.1	1	kernel fragment
		charcoal	0.2		dp
		rhus sp.		4	carbonized
135	S51.10 E157.16 0-10	charcoal	0.3		
		zea mays	0.1	1	cupule fragment
136	S51.10 E157.16 10-20	zea mays		1	cupule fragment
		charcoal	0.1		
137	S51.10 E157.16 20-30	charcoal	0.1		
78	S57.5 E183.5	charcoal	0.5		
74	S57.5 E183.5	charcoal	0.2		
78	S57.5 E183.5 20-30	charcoal	0.1		
77	S62.5 E184	charcoal	0.1		
557	S73.5 E186	charcoal	0.1		
556	S73.5 E186	charcoal	0.1		
		zea mays	0.1	1	cupule fragment
376	S75.5 E188	charcoal	0.1		
		zea mays	0.1		cob and cupule fragments
		cf. ipomoea		1	carbonized
		vitis		1	carbonized
371	S76 E190.5	juglans nigra	0.1		
		charcoal	0.1		
		carya	0.1		
370	S76 E190.5	carya	0.1		
		charcoal	1.0		
362	S76 E190.5	carva	0.1		
		charcoal	0.2		
333	S79.27 E161	charcoal	0.1		
493	S83 E209	zea mays	0.1	1	cupule fragment
		carva	0.1		
		charcoal	0.2		

6. Plants remains from Cedar Grove random samples.

Provenience	Type Remains	Wt.(G)	No.	Remarks
523 S38 E181	charcoal	0.1		
491 S39 E164	charcoal	0.1		
519 S39 E164	charcoal	0.3		acer
524 S39 E164	0			
498 S39 E164	charcoal	0.1		
306 S40 E175	zea mays	0.1		kernel fragment
	rhus sp.		1	carbonized
	charcoal	0.1		
315 S40 E175	charcoal	0.1		
327 S41 E168	charcoal	0.1		
321 S41 E168	charcoal	0.2		
327 S41 E168	zea mays	0.1	1	cupule fragment
314 S41 E168	charcoal	0.1		
324 S41 E168 20-30	charcoal	0.1		platanus
326 S41 E169 30-40	charcoal	0.1		
364 S43 E164	charcoal	0.4		
363 S43 E164	charcoal	0.5		
452 S43 E164	zea mays	0.1		cupule fragments
	charcoal	0.4		
485 S49 E162	charcoal	0.1		
469 S49 E162	0			
484 S49 E162	vitis sp.		1	carbonized
	charcoal	0.3		
355 S49 E162	charcoal	0.1		
317 S51 E168	rhus sp.		1	carbonized
312 S51 E168	charcoal	0.1		
316 S54 E181	charcoal	0.5		
228 S54 E181	charcoal	0.1		
307 S54 E181	charcoal	1.0		
	carya	0.2		
228 S54 E181	zea mays	0.1		kernel and cupule fragments
307 S54 E181	zea mays	0.3		cupule fragments
	zea mays	0.1		cupule fragment
	charcoal	0.5		
228 S54 E181	carya	0.2		
423 S54 E190	0			
420 S54 E190 0-10	charcoal	0.1		taxodium
353 S56 E168	charcoal	0.1		
329 S57 E175	charcoal	0.3		
	fagus grandifolia		3	husk fragments
413 S59 E157	charcoal	0.1		
369 S59 E157	charcoal	0.1		
387 S59 E157 0-10	charcoal	0.2		
391 S59 E157 20-30	charcoal	0.2		
451 S59 E157 50-60	juglans nigra	0.1		
	diospyros virginiana		1	carbonized
	charcoal	0.1		
245 S59 E164	0			
241 S59 E164	charcoal	0.1		
243 S59 E164	0			
79 S59 E164	0			
421 S59 E190	0			
390 S60 E154	charcoal	0.1		
392 S60 E154	charcoal	0.1		
414 S60 E154	charcoal	0.1		
386 S60 E154 10-20	charcoal	0.1		
388 S60 E154 20-30	charcoal	0.1		
230 S61 E179	zea mays	0.1	1	cupule fragment
205 S61 E179	charcoal	0.1		
231 S61 E179	zea mays	0.1	1	cupule fragment
230 S61 E179	charcoal	0.1		
208 S61 E179	charcoal	0.1		
200 S61 E179	charcoal	0.1		
208 S61 E179	zea mays	0.1	2	kernel fragments
167 S62 E164	0			
163 S62 E164	0			
170 S62 E164	charcoal	0.1		
161 S62 E164	charcoal	2.0		fraxinus
172 S62 E164	0			
194 S63 E168	charcoal	0.1		
199 S63 E168	charcoal	0.2		
176 S63 E168	charcoal	0.1		
310 S63 E179	charcoal	0.1		
304 S63 E179	charcoal	0.1		
323 S63 E179	zea mays	0.1		
335 S63 E179	charcoal	0.1		
332 S63 E179	carya	0.1		
329 S63 E179	carya	0.1		
332 S63 E179	vitis sp.		1	carbonized
329 S63 E179	charcoal	[illegible]		

6. Plants remains from Cedar Grove random samples.

Provenience	Type Remains	Wt.(G)	No.	Remarks
332 S63 E179	charcoal	[illegible]		
323 S63 E179	charcoal	0.2		
313 S63 E179	zea mays	0.1		cupule fragment
310 S63 E179	zea mays	0.1		cupule fragment
325 S63 E179 40-50				bone
501 S64 E154	0			
415 S64 E154	charcoal	0.1		
202 S64 E154	charcoal	0.1		
503 S64 E154	charcoal	0.1		
171 S64 E154	0			
197 S65 E175	charcoal	0.1		
195 S65 E175	juglans nigra	0.1		
502 S65 E175	carya	0.1		
	charcoal	0.1		
207 S65 E175	charcoal	0.1		
195 S65 E175	charcoal	0.3		
416 S65 E175	carya	0.1		thin-walled
	charcoal	0.1		
195 S65 E175	zea mays	0.1	1	cupule fragment
198 S65 E175	zea mays	0.1	2	kernel fragments
	charcoal	0.1		
	carya	0.1		
197 S65 E175	carya	0.1		
203 S68 E179 0-10	charcoal	0.1		
229 S68 E179 10-2000	0	3.0		pod of either honey locust or kentucky coffee
242 S68 E179 20-30	charcoal	0.1		cf. diospyros
244 S68 E179 30-40	charcoal	0.5		cf. diospyros
	charcoal	0.1		
381 S68 E179 40-50	charcoal	0.2		
	carya	0.2		
375 S68 E222	zea mays	0.1		kernel and cupule fragments
453 S68 E222	charcoal	0.1		
375 S68 E222	carya	0.1		
	charcoal	0.5		
455 S68 E222	charcoal	0.1		
160 S69 E157	charcoal	2.0		
158 S69 E157	charcoal	0.1		
162 S69 E157	cf. phaseolus vulgaris		1	half seed
155 S69 E157	charcoal	0.1		
166 S69 E157	charcoal	0.5		
	zea mays	0.1	1	cupule fragment
160 S69 E157	zea mays	0.1		kernel fragment
162 S69 E157	zea mays	0.1		kernel fragment
	charcoal	0.5		
259 S69 E184	carya	0.2		
269 S69 E184	carya	0.1		
	zea mays	0.5		cupule fragment
259 S69 E184	zea mays	0.1	1	cupule fragment
	charcoal	0.5		
257 S69 E184	charcoal	1.0		
254 S69 E184	charcoal	0.1		
250 S69 E184	charcoal	0.1		
476 S70 E218	charcoal	0.1		
471 S70 E218	charcoal	0.1		
495 S70 E218	0			
482 S70 E218	0			
471 S70 E218	zea mays	0.1	1	cupule fragment
252 S71 E179	charcoal	0.1		
	fagus grandifolia	0.1	1	husk fragment
270 S71 E179	charcoal	0.1		
256 S71 E179	charcoal	1.0		
	zea mays	0.1	1	cupule fragment
	fagus grandifolia	0.1	3	husk fragments
260 S71 E179 20-30	charcoal	0.1		acer
265 S71 E179 30-40	charcoal	0.1		
251 S73 E184	lagenaria siceraria		1	rind fragment
	diospyros virginiana		1	carbonized
	carya	0.2		thick-walled
	charcoal	0.1		
247 S73 E184	0			
140 S73 E184	charcoal	0.1		
188 S73 E184	charcoal	0.1		
185 S73 E184	0			
262 S73 E184	zea mays	0.1		cupule fragment
	charcoal	0.1		
255 S73 E184 20-30	carya	0.1		thick-walled
248 S74 E184 20-30	charcoal	0.1		acer
232 S75 E168	charcoal	0.1		
175 S75 E168 0-10	0			

6. Plants remains from Cedar Grove random samples.

206	S75 E168	30-40	charcoal	0.9		diffuse porous
204	S74 E168	30-40	charcoal	0.5		ulmaceae/cf. acer
183	S75 E179		charcoal	0.5		
			juglans nigra	0.3		
261	S75 E181		charcoal	0.5		
189	S75 E181		charcoal	0.1		
190	S75 E181		zea mays	0.1	1	cupule fragment
			charcoal	0.1		
266	S75 E181		charcoal	0.5		
187	S75 E181		charcoal	0.1		
271	S75 E181		carya	0.1		
424	S75 E192		carya	0.1		
			charcoal	0.5		
422	S75 E192	0-10	charcoal	0.1		
488	S75 E218		charcoal	0.1		
479	S75 E218		0			
151	S76 E154		charcoal	0.1		
149	S76 E154		charcoal	0.1		
153	S76 E154		charcoal	0.1		
150	S76 E154		zea mays	0.1	1	kernel fragment
153	S76 E154		zea mays	0.1	1	cupule fragment
150	S76 E154		charcoal	0.1		
154	S76 E162		charcoal	0.6		
152	S76 E162		charcoal	0.5		
159	S76 E162		charcoal	0.1		
157	S76 E162		charcoal	0.[illegible]		arundinaria
385	S76 E164		charcoal	0.1		
240	S76 E164		charcoal	0.1		
383	S76 E154	20-30	charcoal	0.1		
373	S77 E214		charcoal	0.1		
368	S77 E214	0-10	charcoal	0.1		
497	S78 E154		0			
525	S78 E154		charcoal	0.1		
520	S78 E154		charcoal	0.1		
164	S78 E168		charcoal	0.4		
156	S78 E168		charcoal	0.2		acer
165	S78 E168	20-30	charcoal	0.1		platanus
173	S78 E168	40-50	charcoal	0.1		cypress/ulmaceae
297	S79 E192		zea mays	0.1	1	cupule fragment
			charcoal	0.1		
295	S79 E192		charcoal	0.1		
			zea mays	0.1	1	cupule fragment
296	S79 E192		charcoal	0.5		
288	S80 E175		charcoal	0.1		
268	S80 E175		charcoal	0.1		
276	S80 E175	10-20	charcoal	0.1		
281	S80 E175	20-30	charcoal	1.1		acer
275	S81 E179		charcoal	0.1		
272	S81 E179		charcoal	0.1		
264	S81 E179	0-10	uncarbonized wood	0.8		
499	S81 E209		carya	0.1		
492	S81 E209		zea mays	0.1	1	cupule fragment
			charcoal	0.1		
486	S81 E209		carya	0.1		
			charcoal	0.1		
481	S81 E209		charcoal	0.2		
380	S81 E222		0			
292	S83 E175		charcoal	0.5		
274	S83 E175	0-10	charcoal	0.2		acer
283	S83 E175	20-30	charcoal	0.1		acer
291	S83 E175	30-40	charcoal	0.1		acer
500	S83 E209		carya	0.1		
			charcoal	0.1		
483	S83 E209		charcoal	0.1		
474	S83 E209		charcoal	0.4		
493	S83 E209	20-30	charcoal	0.1		juglans
			carya	0.1		
282	S85 E181		charcoal	0.1		
280	S85 E181		charcoal	0.4		
278	S85 E181		charcoal	0.5		
366	S85 E19[illegible]		carya	0.1		
			charcoal	0.1		
285	S87 E179		charcoal	0.1		
289	S87 E179	10-20	charcoal	0.1		ulmaceae
290	S88 E184		0			
287	S88 E184	0-10	charcoal	0.5		cf. morus
378	S88 E214		charcoal	0.1		
461	S88 E214		zea mays	0.1		kernel fragments
			charcoal	0.1		
196	S96 E168		charcoal	0.1		

7. Plant remains from other Cedar Grove excavation units.

Provenience		Type Remains	Wt.(G)	No.	
1108-8-1-4		charcoal	0.2		
1108-17-14		charcoal	0.3		
438	E muck ditch	diospyros virginiana		1	carbonized
545	E muck ditch	charcoal	1.1		diospyros
438	E muck ditch	charcoal	0.3		acer
1420	HB 13	uncarbonized wood			uncarb pine with nail
686	hist bur 42	charcoal	0.4		platanus
536	historic roadbed	charcoal	0.2		
432	LT	charcoal	1.4		quercus
735	LTU 11	0			
739	LTU 5	charcoal	0.1		
142	LTU 9	charcoal	0.1		
738	LTU 9	charcoal	0.1		
142	LTU9	carya	0.1		
1412	no prov.	charcoal	0.1		
541	old E-W T4	charcoal	2.8		carya
918	S138 E130	charcoal	8.7		carya
357	S43 E164 0-10				rock
129	S48.77 E157	juglans nigra	0.4		
		charcoal	16.3		cf. acer/salicaceae
469	S49 E162	0			
138	S51.10 E157.16	charcoal	1.5		
62	S54.92 E179.45	carya	1.0		thick-[illegible]ed
		diospyros virginiana		1	carbonized
389	S59E157 10-20	charcoal	0.3		fraxinus
299	S78.5 E191	charcoal	0.4		cf.acer
436	W muck ditch	diospyros virginiana		1	
		charcoal	0.3		arundinaria
544	W muck ditch	charcoal	0.5		
446	W muck ditch	charcoal	0.2		
		carya	0.2		
436	W muck ditch	charcoal	49.4		
		carya illinoensis	0.4		
		nelumbo lutea		1	

APPENDIX X
LITHIC DEBRIS FROM 3LA97 TESTING AND MITIGATION AND LITHIC TOOLS FROM 3LA97 BY ARTIFACT CLASS

1. Lithic debris from 3LA97 testing: all proveniences
2. Lithic debris from 3LA97 mitigation: surface collections
3. Lithic debris from 3LA97 mitigation: backhoe trenches
4. Lithic debris from 3LA97 mitigation: levee transect units
5. Lithic debris from 3LA97 mitigation: large excavation units
6. Lithic debris from 3LA97 mitigation: random column smaples
7. Lithic debris from 3LA97 mitigation: features
8. Lithic debris from 3LA97 mitigation: postmolds
9. Lithic debris from 3LA97 mitigation: aboriginal burials
10. Lithic tools from 3LA97 by artifact class

1. Lithic Debris from 3LA97 Testing: All Provenlences.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1108-1-1	Surf.coll.-3LA97	-			12	8.2g					
80-1108-1-2	Surf.coll.-3LA97	12.8 mm							2	10.0g	
80-1108-1-4	Surf.coll.-3LA97	-			8	34.5g					
80-1108-43-6	NS Trench 2	-			10	11.0					
80-1108-43-7	NS Trench 2	-			7	27.0					
80-1108-43-7	NS Trench 2	12.8 mm					1	17.0			
80-1108-43-8	NS Trench 2	-			2	8.0					
80-1108-43-8	NS Trench 2	12.8 mm							2	3.0	
80-1108-49-1	EW Trench 2	-			3	1.0					
80-1108-49-2	EW Trench 2	-			1	5.5					
80-1108-52-1	EW Trench 3 sec. 3 2.8 cm	-			6	6.0					
80-1108-52-2	EW Trench 3 sec. 3 2.8 cm	-			4	10.0					
80-1108-52-3	EW Trench 3 sec. 3 2.8 cm	12.8 mm							4	5.5	
80-1108-17-1	Test Unit 4	12.8 mm					1	25.5			
80-1108-17-1	Test Unit 4	-			39	45.0g					
80-1108-17-2	Test Unit 4	-			1	1.2g					
80-1108-23-1	Test Unit 4 Lev.1 midden	-			1	7.1g					
80-1108-24-1	Test Unit 6 surf.	-			2	3.4g					
80-1108-25-1	Test Unit 6 Lev. 1	-			7	3.7g					
80-1108-25-2	Test Unit 6 Lev. 1	12.8 mm							3	2.5g	
80-1108-25-3	Test Unit 6 Lev. 1	-	1	4.3	2	1.2g					
80-1108-26-1	Test Unit 6	-			7	4.8g					
80-1108-26-3	Test Unit 6	-			3	3.0g					
80-1108-26-4	Test Unit 6	-			1	2.3g					
80-1108-4-1	T.U.1 Fea. 1	-			109	89.0g					
80-1108-4-2	T.U.1 Fea. 1	-			6	15.7g					
80-1108-4-3	T.U.1 Fea. 1	-			28	91.0g					
80-1108-58-1	Fea.2 NS Trench 4	-			3	1.0					
80-1108-58-3	Fea.2 NS Trench 4	12.8 mm							1	5.5	
80-1108-59-9	Fea.3 NS Trench 4	-			1	0.8					
80-1108-59-10	Fea.3 NS Trench 4	-			1	10.3					
80-1108-59-10	Fea.3 NS Trench 4	12.8 mm					2	20.0			

1 continued. Lithic Debris from 3LA97 Testing: All Provenîences

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/Core #	wt. (g)	Chert edge Damage flakes #	wt. (g)	Other ?
80-1108-59-11	Fea.3 NS Trench 4	-			1	1.7					
80-1108-59-12	Fea.3 NS Trench 4	12.8 mm							1	5.0	
80-1108-59-13	Fea.3 NS Trench 4	-	1	18.0							
80-1108-28-1	Fea.4 Surf.coll.	-			5	3.6g					
80-1108-28-2	Fea.4 Surf.coll	12.8 mm							2	10.0g	
80-1108-28-3	Fea.4 Surf.coll.	-			6	37.5g					
80-1108-28-3	Fea.4 Surf.coll.	12.8 mm					2	22.7g			
80-1108-29-1	Fea.4 N448W494 Lev.1 T.U.1	-			218	147.5g					
80-1108-29-2	Fea.4 N448W494 Lev.1 T.U.1	12.8 mm					1	13.0			
80-1108-29-3	Fea.4 N448W494 Lev.1 T.U.1	-			109	217.0g					
80-1108-29-3	Fea.4 N448W494 Lev.1 T.U.1	12.8 mm					3	33.6	1	10.0g	
80-1108-29-4	Fea.4 N448W494 Lev.1 T.U.1	-	3	4.0g	4	53.0g					
80-1108-29-20	Fea.4 N448W494 Lev.1 T.U.1	-			4	22.0g					
80-1108-29-20	Fea.4 N448W494 Lev.1 T.U.1	12.8 mm					1	8.2g	15	33.0g	
80-1108-29-23	Fea.4 N448W494 Lev.1 T.U.1	-			1	0.4g					
80-1108-30-1	Fea.4 N448W494 Lev.2 T.U.1	-			48	24.8g					
80-1108-30-2	Fea. 4 N448W494 Lev.2 T.U.1	12.8 mm							2	5.5g	
80-1108-30-3	Fea.4 N448W494 Lev.2 T.U.1	12.8 mm							2	1.4g	
80-1108-30-5	Fea.4 N448W494 Lev.2 T.U.1	-									
80-1108-30-5	Fea.4 N448W494 Lev.2 T.U.1	12.8 mm			27	28.5g	1	7.4g			
80-1108-30-7	Fea.4 N448W494 Lev.2 T.U.1 0-10 cm	-			1	0.2g					
80-1108-33-1	Fea.4 N550W512 T.U.2 0-10 cm	12.8 mm							1	1.5	

1 continued Lithic Debris from 3LA97 Testing: All Proveniences

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1108-33-2	Fea.4 N550W512 T.U. 2 0-10 cm	-			2	10.0g					
80-1108-37-1	Fea.4 T.P.5	-			46	21.5					
80-1108-37-2	Fea.4 T.P.5	12.8 mm					1	8.3	2	7.3	
80-1108-37-3	Fea.4 T.P.5	-			19	22.5					
80-1108-37-3	Fea.4 T.P.5	12.8 mm					1	9.0			
80-1108-37-4	Fea.4 T.P.5	-			x2	7.0					
80-1108-40-1	Fea.6 Surf.coll.	-			70	93.2					
80-1108-40-2	Fea.6 Surf.coll.	-			37	147.5					
80-1108-40-2	Fea.6 Surf.coll.	12.8 mm					5	60.0			
80-1108-40-3	Fea.6 Surf.coll.	-	2	7.0	x1	40.3					
80-1108-40-5	Fea.6 Surf.coll.	-			1	6.8					
80-1108-40-5	Fea.6 Surf.coll.	12.8 mm							19	36.0	flakes mixed 40-6
80-1108-40-6	Fea.6 Surf.coll.	-			1	15.0					
80-1108-40-6	Fea.6 Surf.coll.	12.8 mm							3	4.0	flakes mixed 40-
80-1108-35-1	Area 4 T.U.5 PM	-			9	3.3g					
80-1108-35-1?	Area 4 T.U.5 PM	12.8 mm							1	1.8	
80-1108-35-3	Area 4 T.U.5 PM	-			6	3.5g					

T.U. Test Unit
LTU Levee Transect Unit
CS Column Sample
HB Historic Burial
B Aboriginal Burial
PM Post Mold
Fea. Feature
BT Backhoe Trench

2. Lithic Debris from 3LA97 Mitigation: Surface Collections.

3LA97 Lithic Debris Catalog #	Surface Provenience (NonGrid)	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage Flakes #	Chert edge Damage Flakes wt. (g)	Other ?
80-1209-1	Whole site surface	6.4 mm			12	16.5					
80-1209-1	Whole site surface	12.8 mm			13	54.0	1	3.6	6	19.8	
80-1209-3	H.Burial #9 backdirt surface	6.4 mm			1	0.4					
80-1209-3	H.Burial #9 backdirt surface	12.8 mm			2	11.0					
80-1209-4	general backdirt surface	12.8 mm			1	4.8					
80-1209-6	H.Burial #6 Grave Fill	6.4 mm			1	1.5					
80-1209-6	H.Burial #6 Grave Fill	12.8 mm	1	4.5							
80-1209-8	H.Burial #9 Grave Fill backdirt	6.4 mm			2	3.7					
80-1209-8	H.Burial #9 Grave Fill backdirt	12.8 mm			2	11.3	3	39.8			
80-1209-9	W.Extent of midden	12.8 mm			1	2.7					
80-1209-11	Stripping Gen. coll.	6.4 mm			14	9.5			1	1.1	
80-1209-11	Stripping Gen. coll.	12.8 mm			19	108.5	4	93.0*	1	2.2	at least 1 BP H Quartzite 74.5 hammerstone-tool
80-1209-13	Old Levee Fill	<6.4 mm			11	1.0					
80-1209-13	Old Levee Fill	6.4 mm			37	24.7			2	3.0	
80-1209-13	Old Levee Fill	12.8 mm			17	106.0		8.5	1	1.3	
80-1209-17	Shovel trench S48-57E181	6.4 mm			3	5.5					
80-1209-17	Shovel test S48-57E181	12.8 mm			2	16.0	1	11.0			
80-1209-38	Area around S72-E212	6.4 mm			1	0.2					
80-1209-38	Area around S72-E212	12.8 mm			1	1.0					
80-1209-425	Midden W of levee	12.8 mm					2	17.0			
80-1209-428	Midden W of levee Unit 12 W of trans	12.8 mm					1	13.8			

2 continued. Lithic Debris from 3LA97 Mitigation: Surface Collections.

3LA97 Lithic Debris Catalog #	Surface Provenience (Nongrid)	Size Grade in mm	Nonchert sandstone, etc. #	Nonchert sandstone, etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-431	South of levee transect	6.4 mm			8	10.0					
80-1209-431	South of levee transect	12.8 mm			6	98.2			1	2.7	
80-1209-432	Overburden levee transect	6.4 mm			10	9.6			2	4.0	
80-1209-432	Overburden levee transect	12.8 mm	2	193.2	68	661.4	20	287.5	7	38.7	+1 chert cobble 20. cu.
80-1209-450	Levee fill & midden W of LT Units 7&8	6.4 mm	1	0.1	12	5.8					
80-1209-450	Levee fill & midden W of LT Units 7&8	12.8 mm			4	18.5					
80-1209-532	Midden between levee & waterscreen trench	6.4 mm	4	6.1	58	70.6			6	8.2	
80-1209-532	Midden between levee & waterscreen trench	12.8 mm	3	174.5	92	744.0	19	237.5	7	42.2	+7 chert cobble 247.0 cu ground hematite
80-1209-533	Midden backdirt east of Levee	6.4 mm	2	0.2	77	74.1			2	3.0	
80-1209-533	Midden backdirt east of Levee	12.8 mm	3	36.0	43	345.0	14	160.0	4	26.6	+3 chert cobbles 33 cu
80-1209-536	Fea. east of east muck ditch Unit 8	12.8 mm			5	24.3	2	36.0			
80-1209-537	Midden West of Levee transect	6.4 mm	1	1.8	25	27.0					11-25-80
80-1209-537	Midden West of levee transect	12.8 mm	1	2.8	12	171.0					11-25-80 1+1 QT2 Cobble 8.5 cu
80-1209-537	Midden West of Levee transect	6.4 mm			*1	3.0			1	1.3	11-27-80 1* Pieces Esquillees

2 continued. Lithic Debris from 3LA97 Mitigation: Surface Collections.

3LA97 Lithic Debris Catalog #	Surface Provenience (Nongrid)	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage Flakes #	Chert edge Damage Flakes wt. (g)	Other
80-1209-537	Midden West of Levee transect	12.8 mm	1	5.2	23	160.5	18	269.5	7	30.7	+ 4 chert cobbles 82.0g
80-1209-538	Midden backdirt pile from W Levee	6.4 mm	2	2.0	11	15.6			1	3.0	
80-1209-538	Midden backdirt pile from W Levee	12.8 mm			13	99.2	6	96.7	1	5.7	+ 1 chert cobble 8.0g
80-1209-540	Midden east of waterscreen trench	6.4 mm			1	0.9					
80-1209-540	Midden east of waterscreen trench	12.8 mm	1	32.2	1	3.3	1	6.5			
80-1209-541	Old E-W trench #4	6.4 mm			4	3.3					
80-1209-541	Old E-W trench #4	12.8 mm			7	40.1	2	16.0	2	3.0	
80-1209-542	S. of backhoe Trench 3 Fea. due West Powell grave	12.8 mm			2	31.0					
80-1209-646	surface-misc.	6.4 mm			2	2.9					8-7-80
80-1209-646	surface-misc.	12.8 mm			3	13.6					8-7-80
80-1209-646	surface-misc.	6.4 mm			4	3.6					12-3-80
80-1209-646	surface-misc.	12.8 mm			2	8.1	1	5.8			12-3-80
80-1209-665	88 cm West of Levee trans. Unit 6 Burial 3	6.4 mm			2	0.8					
80-1209-744	E side of LT-overburden/fill	<6.4 mm			1	0.1					
80-1209-744	E side overburden/ LT fill	6.4 mm			11	11.3					
80-1209-744	E side LT overburden/fill	12.8 mm	1	34.2	14	208.0	4	53.0			+ 1 chert cobble 76.0g
80-1209-748	Ext. Unit-W of LT Unit 6 W of B7	6.4 mm	1	1.6	1	0.3					
80-1209-748	Ext. Unit W of LT Unit 6 W of B7	12.8 mm			7	115.0	3	38.5			
80-1209-875	General midden stripping	6.4 mm	1	3.0	6	8.8					

2 continued. Lithic Debris from 3LA97 Mitigation: Surface Collections.

3LA97 Lithic Debris Catalog #	Surface Provenience (Nongrid)	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-875	General midden stripping	12.8 mm			11	89.0	4	144.1			+ 5 cobbles 211.2g
80-1209-876	General site surface	6.4 mm			11	10.0					
80-1209-876	General site surface	12.8 mm			19	170.5	4	51.5			
80-1209-940	West of Burial 10	6.4 mm			1	1.0					
80-1209-940	West of Burial 10	12.8 mm			5	70.0			1	7.0	
80-1209-941	West of Burial 7	6.4 mm			2	2.5					
80-1209-941	West of Burial 7	12.8 mm			7	100.8	2	31.2			
80-1209-943	East of Levee transect	6.4 mm	1	0.3	3	5.0					
80-1209-943	East of Levee transect	12.8 mm			12	142.7	3	56.2			2 chert cobble
80-1209-1090	Gen. surface & backdirt	6.4 mm			13	12.5					
80-1209-1090	Gen. surface & backdirt	12.8 mm			13	90.4	3	53.5			
80-1209-1453	General surface	6.4 mm			12	11.5					
80-1209-1453	General surface	12.8 mm			21	152.0	8	154.0			+ 1 chert cobble 56.2g
80-1209-1454	surface	6.4 mm			7	9.9					
80-1209-1454	surface	12.8 mm	1	6.8	11	179.1	7	129.0			
80-1209-1483	General surface	6.4 mm			4	4.3					
80-1209-1483	General surface	12.8 mm			3	20.2					
80-1209-1550	W of Levee transect midden	6.4 mm			3	4.3					
80-1209-1550	W of levee transect midden	12.8 mm			3	50.6	2	24.5			
80-1209-1412	Lost-unknown	6.4 mm			44	30.7					
80-1209-1412	Lost-unknown	12.8 mm			6	19.5					

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial

B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

3. Lithic Debris from 3LA97 Mitigation: Backhoe Trenches.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-39	B.T. 2 midden	6.4 mm			1	0.3					
80-1209-53	B.T. 2	6.4 mm			1	1.0					
80-1209-53	B.T. 2	12.8 mm			2	8.0					
80-1209-96	S55E176.29 B.T. 2	12.8 mm			1	3.0					
80-1209-101	S55E159.48 B.T. 2	12.8 mm					1	8.0			
80-1209-103	B.T. 2	12.8 mm	*1	358.0							* Conglom.
80-1209-1420	HB 13 Backhoe Tr. 2	12.8 mm			3	27.6					
80-1209-24	S54.92E179.45 E.Ext. B.T. 2	<6.4 mm			2	0.4					
80-1209-24	S54.92E179.45 E.Ext. B.T. 2	6.4 mm			10	9.6					
80-1209-24	S54.92E179.45 E.Ext. B.T. 2	12.8 mm			17	118.4	4	46.0	1	6.5	
80-1209-62	B.T. 2 S54.92E179.45	<6.4 mm			51	7.3					
80-1209-62	B.T. 2 S54.92E179.45	6.4 mm	7	6.8	482	260.5	1*	3.2	14	5.0	* Not BP
80-1209-62	B.T. 2 S54.92E179.45	12.8 mm	1	2.0	110	439.5	8*	102.7	3	2.5	* Not BP
80-1209-63	B.T. 2 S54.92E179.45	<6.4 mm	1	0.1	14	1.0					
80-1209-63	B.T. 2 S54.92E179.45	6.4 mm	2	0.4	63*	32.5			1	0.5	*4 flakes nov. -1 edge retouched cobble
80-1209-63	B.T. 2 S54.92E179.45	12.8 mm			39	218.0	5	68.5	9	26.0	+ 1 hammerstone
80-1209-341	East Ext. Backhoe Tr. 2 S54.92E179.45 surface	6.4 mm			3	2.9					
80-1209-341	East Ext. Backhoe Tr. 2S54.92E179.45 surface	12.8 mm			9	147.0			2	13.3	
80-1209-65	B.T. 2S55E187.35	<6.4 mm			9	1.7					
80-1209-65	B.T. 2S55E187.35	6.4 mm	1	0.7	90	46.5			2	1.7	
80-1209-65	B.T. 2S55E187.35	12.8 mm			18	106.8	1	14.5	2	2.5	
80-1209-66	B.T. 2S55E187.35	<6.4 mm			1	0.1					
80-1209-66	B.T. 2 S55E187.35	6.4 mm			1	0.2					
80-1209-66	B.T. 2 S55E187.35	12.8 mm			2	14.5	1*	22.3	4	18.0	* Not BP
80-1209-46	B.T. 3N.Wall, S42E162.94	12.8 mm			1	2.7					

3 continued. Lithic Debris from 3LA97 Mitigation: Backhoe Trenches.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/Core #	wt. (g)	Chert edge Damage flakes #	wt. (g)	Other ?
80-1209-49	B.T. 3 N. Wall S42E165.84	6.4 mm			1	0.2					
80-1209-50	B.T. 3 R.88 S42E172.48	12.8 mm			1	1.3					
80-1209-87	S.Wall S43E168.68 B.T. 3	6.4 mm			1	0.7					
80-1209-87	S.Wall S43E168.68 B.T. 3	12.8 mm			2	2.5					
80-1209-90	S43E164.97 B.T. 3	6.4 mm			1	0.1					
80-1209-38	B.T. 4	6.4 mm			1	0.2					
80-1209-38	B.T. 4	12.8 mm			1	1.0					

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial
B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

4. Lithic Debris from 3LA97 Mitigation: Levee Transect Units

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-679	Levee trans. Unit 0 fill	6.4 mm	6	6.0	160	81.8			1	3.0	
80-1209-679	Levee Trans. Unit 0 fill	12.8 mm			38	187.0	4	37.0	2	8.2	
80-1209-680	Levee Trans. Unit 0 fill	6.4 mm	3	3.5	255	145.0	1	5.3			
80-1209-680	Levee Trans. Unit 0 midden	12.8 mm	1	5.5	65	258.5	7	68.3	4	22.8	
80-1209-684	Levee Trans. Unit 0 midden	6.4 mm			1	2.1					+ 1 edge retouched cobble 13.6g
80-1209-684	Levee Trans. Unit 0 midden	12.8 mm			3	18.3					
80-1209-674	Levee Trans. Unit 1 fill	6.4 mm	12	9.4	376	214.0					+ 1 chert pebble 0.9g
80-1209-674	Levee Trans. Unit 1 fill	12.8 mm	2	25.8	*92	584.8	13	138.5	5	12.7	* 2 pieces esquillees 1.8g
80-1209-677	Levee Trans. Unit 1 midden	6.4 mm	13	2.7	372	239.7			1	0.7	+ 1 chert cobble 2.3g
80-1209-677	Levee Trans. Unit 1 midden	12.8 mm	1	35.6	96	477.0	10	112.0	3	13.4	+ 4 chert cobble 9.0g
80-1209-120	Levee Trans. Unit 2 fill	<6.4 mm			2	0.2					
80-1209-120	Levee Trans. Unit 2 fill	6.4 mm			17*	14.3					* 1 flake Agatized Calcedony
80-1209-120	Levee Trans. Unit 2 fill	12.8 mm			9	56.3	7	104.0	1	4.0	
80-1209-122	Levee Trans. Unit 2 fill	<6.4 mm			10	1.5					
80-1209-122	Levee Trans. Unit 2 fill	6.4 mm	4	3.8	204	100.4					* 4 Agatized Calced. Flakes-cortex-locat.

4. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-31	Levee Trans. Unit 12 midden	6.4 mm			137	84.0					
80-1209-31	Levee Trans. Unit 12 midden	12.8 mm	1	2.0	39	189.3	3*	36.0	1	2.0	* core nuclei Not BP
80-1209-80	Levee Trans. Unit 12 fill	6.4 mm			1	0.5					
80-1209-80	Levee Trans. Unit 12 fill	12.8 mm					2*	21.0			* Not BP
80-1209-81	Levee Trans. Unit 12 fill	<6.4 mm			1	0.1					
80-1209-81	Levee Trans. Unit 12 fill	6.4 mm			5	3.0					
80-1209-81	Levee Trans. Unit 12 fill	12.8 mm			1	5.5					
80-1209-82	Levee Trans. Unit 12 fill	6.4 mm			79	57.7					
80-1209-82	Levee Trans. Unit 12 fill	12.8 mm	2	16.3	20	87.8	2	40.0			
80-1209-83	Levee Trans. Unit 12 fill	<6.4 mm			2	0.3					
80-1209-83	Levee Trans. Unit 12 fill	6.4 mm			2	4.0					
80-1209-83	Levee Trans. Unit 12 fill	12.8 mm			6	25.0	2*	46.0			* Not BP
80-1209-84	Levee Trans. Unit 12 fill	6.4 mm			1	1.2					
80-1209-84	Levee Trans. Unit 12 fill	12.8 mm			1	6.5					
80-1209-26	Levee Trans. Unit 12 midden	6.4 mm			4	2.7					
80-1209-26	Levee Trans. Unit 12 midden	12.8 mm			2	6.3					
80-1209-27	Levee Trans. Unit 12 midden CS 10-20 cm	6.4 mm	1	0.3	4	3.0					
80-1209-27	Levee Trans. Unit 12 CS 10-20 cm	12.8 mm			3	24.7	1*	5.3			* core nuclei Not BP

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-28	Levee Trans. Unit 12 CS 20-30 cm	6.4 mm			7	5.2					
80-1209-29	Levee Trans. Unit 12 CS 40-50 cm	6.4 mm	1	0.2	5	2.0					+ 1 uniface *frag. 2.0g*
80-1209-216	Levee Trans. W. Ext. Unit 12 fill	12.8 mm	1	1.8					1	16.0	
80-1209-217	Levee Trans. W. Ext. Unit 12 fill	6.4 mm	1	1.0	37	28.2					
80-1209-217	Levee Trans. W. Ext. Unit 12 fill	12.8 mm	1	1.6	11	43.0	3	30.0			
80-1209-433	S end of Levee S of Unit 12 midden	6.4 mm	8	6.0	245	168.5			4	3.2	
80-1209-433	S. end of levee S of Unit 12 midden	12.8 mm	3	39.5	107	531.3	12	153.0	4	27.0	+ 1 hammerstone 48.0g
80-1209-623	Levee Trans. Unit 14 midden & fill	6.4 mm			7	5.3					
80-1209-623	Levee Trans. Unit 14 midden & fill	12.8 mm					1	14.9			
80-1209-1329	Area just S of LT Unit 13 - LT Unit 14	12.8 mm			3	12.6					
80-1209-15	S.T. Trans. 3.1	6.4 mm			1	3.6					

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4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-549	Levee Trans. Unit 3 midden	6.4 mm			6	1.8					
80-1209-549	Levee Trans. Unit 3 midden	12.8 mm			9	94.6	3	39.0			
80-1209-550	Levee Trans. Unit 3 midden	6.4 mm	3	3.5	426	217.2			2	1.2	
80-1209-550	Levee Trans. Unit 3 midden	12.8 mm	3	28.6	80	359.3	5	30.5			+ 1 chert cobble 14.3g
80-1209-668	Levee Trans. Unit 4 fill	6.4 mm	5	5.0	204	132.0			2	1.8	
80-1209-668	Levee Trans. Unit 4 fill	12.8 mm	1	8.2	63	274.8	10	111.5	*2	16.2	* edge retouched cobbles + 1 chert cobble 7.7g
80-1209-671	Levee Trans. Unit 4 midden	6.4 mm	4	3.4	320	200.4					+ 1 chert pebble 2.7g
80-1209-671	Levee Trans. Unit 4 midden	12.8 mm	1	6.0	66	349.4	7	73.6		14.7	+ 1 chert cobble 6.7g
80-1209-237	Levee Trans. Unit 5 fill	6.4 mm			13	17.4					
80-1209-237	Levee Trans. Unit 5 fill	12.8 mm			11	49.7	2	58.0			
80-1209-504	Levee Trans. Unit 5 fill	6.4 mm	11	6.8	127	89.2	1	2.5	1	1.5	+ 1 pebble 1.0
80-1209-504	Levee Trans. Unit 5 fill	12.8 mm			25	155.1	2	23.5	2	3.7	1 chert, 1 qtz. cobble 20.0g
80-1209-591	Levee Trans. Unit 5 midden	6.4 mm	2	2.5	53	40.3					
80-1209-591	Levee Trans. Unit 5 midden	12.8 mm			18	96.0	10	86.0	1	8.0	
80-1209-592	Levee Trans. Unit 5 midden	6.4 mm	1	0.7	84	42.5					

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-592	Levee Trans. Unit 5 midden	12.8 mm	1	3.1	5	27.1			2	4.3	
80-1209-739	SWall overburden/ LT Unit 5 fill	6.4 mm			2	0.5					
80-1209-739	SWall overburden/ LT Unit 5 fill	12.8 mm			1	3.3					
80-1209-742	SWall LT Unit 5 midden	6.4 mm			2	0.7					
80-1209-745	SWall LT Unit 5 fill/midden	6.4 mm			2	1.5					
80-1209-745	SWall LT Unit 5 fill/midden	12.8 mm					1	11.0			
80-1209-236	Levee Trans. Unit 5 CS 0-10 cm	6.4 mm			13	7.0					
80-1209-236	Levee Trans. Unit 5 CS 0-10 cm	12.8 mm	1	16.5	4	12.5					
80-1209-238	Levee Trans. Unit 5 CS 10-20 cm	6.4 mm			8	5.2					
80-1209-238	Levee Trans. Unit 5 CS 10-20 cm	12.8 mm			2	8.1					
80-1209-109	Levee Trans. Unit 6 fill	<6.4 mm			4	0.5					
80-1209-109	Levee Trans. Unit 6 fill	6.4 mm			99	66.7					
80-1209-109	Levee Trans. Unit 6 fill	12.8 mm	1	23.0	21	110.0	3	35.2	1	2.4	
80-1209-111	Levee Trans. Unit 6 midden	6.4 mm			5	3.0					
80-1209-111	Levee Trans. Unit 6 midden	12.8 mm			3	12.0	2	18.0			
80-1209-121	Levee Trans. Unit 6 midden	<6.4 mm			9	1.5					
80-1209-121	Levee Trans. Unit 6 midden	6.4 mm	6	4.3	113	67.5					
80-1209-121	Levee Trans. Unit 6 midden	12.8 mm			29	132.0	4	31.6			

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-221	Levee Trans. Unit 8 midden	6.4 mm			2	1.2					
80-1209-222	CS Unit 8 surf. control	12.8 mm			8	62.0	2	42.0			
80-1209-223	Levee Trans. CS Unit 8 0-10 cm	6.4 mm			10	5.8					
80-1209-223	Levee Trans. CS Unit 8 0-10 cm	12.8 mm			4	9.8					
80-1209-224	Levee Trans. CS Unit 8 10-20 cm	6.4 mm			10	7.3					
80-1209-224	Levee Trans. CS Unit 8 10-20 cm	12.8 mm	1	5.0							
80-1209-225	Levee Trans. CS Unit 8 20-30 cm	12.8 mm			1	2.5					
80-1209-226	Levee Trans. Unit 8 midden	6.4 mm	6	5.0	84	58.0					
80-1209-226	Levee Trans. Unit 8 midden	12.8 mm	1	17.7	25	96.5					
80-1209-732	Levee Trans. Unit 8 midden	12.8 mm			1	4.7					
80-1209-737	SWall-midden Levee Trans. Unit 8	6.4 mm			5	2.4					
80-1209-737	SWall-midden Levee Trans. Unit 8	12.8 mm			3	19.6					
80-1209-110	Levee Trans. Unit 9 fill	<6.4 mm			2	0.3					
80-1209-110	Levee Trans. Unit 9 fill	6.4 mm	10	10.0	112	70.0					
80-1209-110	Levee Trans. Unit 9 fill	12.8 mm	1	2.8	26	111.8	3	14.3	1	4.0	
80-1209-112	Levee Trans. Unit 9 midden	<6.4 mm			4	0.2					
80-1209-112	Levee Trans. Unit 9 midden	6.4 mm	9	10.0	159	95.9					
80-1209-112	Levee Trans. Unit 9 midden	12.8 mm			70*	385.0	5	47.0			* 1 pieces esquillees bifacial thin.

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-142	Levee Trans. Unit 9 All levels	6.4 mm			8	4.3					
80-1209-142	Levee Trans. Unit 9 All levels	12.8 mm	1	2.0	5	21.0	3	45.7			
80-1209-738	SWall-overburden/ fill Levee Trans. Unit 9	6.4 mm			3	1.7					
80-1209-738	SWall-overburden/fill Levee Trans. Unit 9	12.8 mm			1	8.7					
80-1209-741	SWall LT Unit 9 midden	6.4 mm			4	2.0					
80-1209-113	Levee Trans. Unit 9 CS 0-10 cm	6.4 mm			13	8.0					
80-1209-113	Levee Trans. Unit 9 CS 0-10 cm	12.8 mm			4	20.0	1	9.7			
80-1209-114	Levee Trans. Unit 9 CS 10-20 cm	6.4 mm			9	8.4					
80-1209-114	Levee Trans. Unit 9 CS 10-20 cm	12.8 mm			1	4.0					
80-1209-214	Levee Trans. Unit 10 fill	6.4 mm			4	3.6					
80-1209-214	Levee Trans. Unit 10 fill	12.8 mm	2	6.0	14	70.5	5	47.3	1	0.9	+ 2 chert cobbles 90.0g
80-1209-215	Levee Trans. Unit 10 fill	6.4 mm	7	5.2	150	105.7					
80-1209-215	Levee Trans. Unit 10 fill	12.8 mm	4	33.0	43	168.5	5	57.5			+ 2 chert pebbles 12.0g
80-1209-320	Levee Trans. Unit 10 midden	6.4 mm	5	2.7	114	104.8					
80-1209-320	Levee Trans. Unit 10 midden	12.8 mm			56	324.8	11	86.0	2	5.5	
80-1209-743	SWall LT Unit 10 midden	6.4 mm			8	5.0					
80-1209-743	SWall LT Unit 10 midden	12.8 mm							1	2.6	

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/Core #	Chert Bipolar Nuclei/Core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-746	LT Unit 10 midden	6.4 mm			5	2.7					
80-1209-746	LT Unit 10 midden	12.8 mm							1	2.2	
80-1209-873	LT Unit 10 backdirt surf.	6.4 mm			1	0.7					
80-1209-873	LT Unit 10 backdirt surf.	12.8 mm			2	7.7	2	48.5			
80-1209-30	Levee Trans. Unit 11 fill	<6.4 mm			4	0.7					
80-1209-30	Levee Trans. Unit 11 fill	6.4 mm			12	15.5					
80-1209-30	Levee Trans. Unit 11 fill	12.8 mm			19	165.5	2	20.5	2	13.0	+ core nuclei Not BP
80-1209-32	Unit 11 Levee Trans. midden	6.4 mm			186	122.3			2	3.2	
80-1209-32	Unit 11 Levee Trans. midden	12.8 mm	2	41.0	46	215.5	8*	111.0	5	21.5	- 2 of the 8 bipolar
80-1209-85	Levee Trans. Unit 11 fill	<6.4 mm			7	1.3					
80-1209-85	Levee Trans. Unit 11 fill	6.4 mm			143	90.6					
80-1209-85	Levee Trans. Unit 11 fill	12.8 mm			40	175.2	4	39.3	2	5.2	
80-1209-86	Levee Trans. Unit 11 midden	6.4 mm			11	14.0					
80-1209-86	Levee Trans. Unit 11 midden	12.8 mm			20	194.2			1	2.0	
80-1209-736	SWall-overburden Levee Trans. Unit 11 fill	6.4 mm			4	1.0					
80-1209-736	Levee Trans. Unit 11 SWall overburden & fill	12.8 mm			1	1.0					
80-1209-740	SWall LT Unit 11 midden	6.4 mm			2	2.7					

4 continued. Lithic Debris from 3LA97 Mitigation: Levee Transect Units.

3LA97 Lithic Debris Catalog #	LTU Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-122	Levee Trans. Unit 2 fill	12.8 mm			37	152.8	1	11.8			+ 1 edge damaged cobble 4.0g
80-1209-141	Levee Trans. Unit 2 midden	6.4 mm	6	7.0	652*	282.0					* 1 pieces esquillees
80-1209-141	Levee Trans. Unit 2 midden	12.8 mm	4	42.5	53	197.3	12	127.0			
80-1209-148	Levee Trans. Unit 2 midden	6.4 mm	1	0.7	17	12.2					
80-1209-148	Levee Trans. Unit 2 midden	12.8 mm			11	83.3	2	35.2	3	12.5	
80-1209-143	Levee Trans. Unit 2 C.S. surf	6.4 mm			21	11.7					
80-1209-143	Levee Trans. Unit 2 C.S. surf.	12.8 mm			4	14.0					
80-1209-144	Levee Trans Unit 2 C.S. 0-10 cm	6.4 mm	1	1.2	21	7.5					
80-1209-145	Levee Trans. Unit 2 C.S. 10-20 cm	6.4 mm			8	3.8					
80-1209-145	Levee Trans. Unit 2 C.S. 10-20 cm	12.8 mm			1	2.0					
80-1209-146	Levee Trans. Unit 2 C.S. 20-30 cm	6.4 mm			4	1.2					
80-1209-147	Levee Trans. Unit 2 C.S. 30-40 cm	6.4 mm			3	0.6					
80-1209-147	Levee Trans. Unit 2 C.S. 30-40 cm	12.8 mm							1	4.0	
80-1209-547	Levee Trans. Unit 3 fill	6.4 mm	1	1.3	1	1.1					0
80-1209-547	Levee Trans. Unit 3 fill	12.8 mm			6	38.0	1	10.0			
80-1209-548	Levee Trans. Unit 3 fill	6.4 mm	9	7.6	115	194.3					
80-1209-548	Levee Trans. Unit 3 fill	12.8 mm			71	378.3	6	116.5	1	2.5	+ 1 quartz cobble

5. Lithic Debris from 3LA97 Mitigation: *Large Excavation Units.*

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone, etc. #	Nonchert sandstone, etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
Large Excavation Units - Direct Impact											
80-1209-370	S76E190.5 CS 10-20 cm	6.4 mm			8	7.0					
80-1209-370	S76E190.5 CS 10-20 cm	12.8 mm			2	10.5					
80-1209-362	S76E190.5 CS 0-10 cm	6.4 mm			2	1.2					
80-12090367	S76E190.5 CS 0-10 cm	12.8 mm			1	3.6					
80-1209-298	S78.5E191	12.8 mm			6	73.2	1	8.2	1	5.4	
80-1209-299	S78.5E191	6.4 mm	6	7.0	161	109.6			7	6.8	
80-1209-299	S78.5E191	12.8 mm			66	323.0	8	90.0	2	7.0	
80-1209-295	S79E192 CS 0-10 cm	6.4 mm			1	0.1					
80-1209-296	S79E192 CS 10-20 cm	6.4 mm			10	4.9					
80-1209-296	S79E192 CS 10-20 cm	12.8 mm			1	3.0			1	5.0	
80-1209-58	S72E212	<6.4 mm			1	0.1					
80-1209-58	S72E212	6.4 mm			91	54.0					
80-1209-58	S72E212	12.8 mm	1	2.8	18	103.5	1*	5.0			* core nuclei Not BP
80-1209-59	S72E212	12.8 mm			4	26.0					
Large Excavation Units - Indirect Impact											
80-1209-1029	E of S 138 E133 N of S140.84E133	12.8 mm			2	12.2					
80-1209-1030	S&E of S141E130 Expl. Unit	6.4 mm			6	11.5					
80-1209-1030	S&E of S141E130 Expl. Unit	12.8 mm	2	197.5	7	71.1	1	25.0			+ 2 chert cobbles 27.5g
80-1209-1031	N of S140.84E133 Expl. Unit	6.4 mm			4	5.3					
80-1209-1031	N of S140.84E133	12.8 mm	3	26.0	6	53.5	6	94.2			
80-1209-1033	N of S144 E133 Exp. Unit										No artifacts

5 continued. Lithic Debris from 3LA97 Mitigation: Large Excavation Units.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
	Large Excavation Units - Indirect Impact										
80-1209-1028	S141.84E130	12.8 mm			1	1.0					
80-1209-920	S138E130 overburden	6.4 mm			3	3.5					
80-1209-922	S138E136 midden	12.8 mm			1	15.0	2	24.8			
80-1209-928	S139.50E132 CS 10-20 cm	12.8 mm			1	9.1					
80-1209-921	S141E130 midden ca 9 cmbs	6.4 mm	6	6.0	56	30.0					
80-1209-921	S141E130 midden ca 9 cmbs	12.8 mm	3	99.0	22	149.5	1	4.2			
80-1209-923	S141E136 midden	6.4 mm			4	3.5					
80-1209-923	S141E136 midden	12.8 mm			2	46.8					
80-1209-926	S141E131.5 CS 0-10 cm	6.4 mm			4	1.3					
80-1209-1007	Ext. trench - control E of S144E133	6.4 mm			2	1.3					
80-1209-1008	Ext. trench E of S144E133 midden	12.8 mm	1	47.0	1	1.9			1	2.5	+ 1 edge retouched cobble 8.9g
80-1209-1428	W of Levee S144E133 to S144E130	12.8 mm			1	14.0					
80-1209-1001	Ext. trench S of S144E130										No artifacts
	Large Excavation Units - Direct Impact										
80-1209-18	S54E184 (344)	6.4 mm			4	4.3					
80-1209-18	S54E184 (344)	12.8 mm			5	26.8					
80-1209-69	S54E184 midden	<6.4 mm			15	3.0					
80-1209-69	S54E184 midden	6.4 mm			133	61.0			2	1.0	
80-1209-69	S54E184 midden	12.8 mm			15	65.0					
80-1209-70	S54E184 midden	<6.4 mm			11	1.3					
80-1209-70	S54E184 midden	6.4 mm			37	26.7					
80-1209-70	S54E184 midden	12.8 mm	1	5.5	10	46.2	1*	15.0	2	11.2	* Not BP

5 continued. Lithic Debris from 3LA97 Mitigation: Large Excavation Units.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
Large Excavation Units - Direct Impact											
80-1209-64	S57E184	<6.4 mm			19	3.5					
80-1209-64	S57E184	6.4 mm	3	4.0	*178	84.2			4	4.5	8 Nov. flakes
80-1209-64	S57E184	12.8 mm			16	82.0	4	48.5	3	12.0	
80-1209-71	S57E184 midden	<6.4 mm	1	0.1	7	1.4					
80-1209-71	S57E184 midden	6.4 mm	1	1.3	27	12.5					
80-1209-71	S57E184 midden	12.8 mm			7	38.8			1	2.0	+ 1 ground stone frag. 21.5g
80-1209-74	S57.5E183.5 midden	6.4 mm			8	3.0					
80-1209-76	S57.5E183.5	6.4 mm			8	9.6					
80-1209-76	S57.5E183.5	12.8 mm			2	3.5					
80-1209-78	S57.5E183.5	6.4 mm			5	1.7					
80-1209-72	S60E184 midden	<6.4 mm			1	0.2					
80-1209-72	S60E184 midden	6.4 mm			1	0.3					
80-1209-72	S60E184 midden	12.8							1	2.3	
80-1209-75	S62.5E184	6.4 mm			3	1.0					
80-1209-75	S62.5E184	12.8 mm					1*	5.0			* Not BP
80-1209-552	E185S72.5 midden	6.4 mm			2	4.8			1	1.0	
80-1209-552	E184S72.5 midden	12.8 mm			4	18.0	1	12.0	1	5.5	
80-1209-553	E185S72.5 midden	6.4 mm	5	2.8	261	170.6			8	14.2	
80-1209-553	E185S72.5 midden	12.8 mm			29	301.5	25	224.0	8	26.0	+ 2 crt cobbles 19.3 + 3 edge retouched cobbles 15.5g
80-1209-555	E186S73.5 CS 0-10 cm	6.4 mm			5	3.6					
80-1209-555	E186S73.5 Cs 0-10 cm	12.8 mm			1	0.9					
80-1209-556	E186S73.5 CS 10-20 cm	6.4 mm			9	5.1					
80-1209-556	E186S73.5 CS 10-20 cm	12.8 mm			1	3.0					
80-1209-557	E186S73.5 CS 20-30 cm	6.4 mm			1	0.8					

5 continued. Lithic Debris from 3LA97 Mitigation: Large Excavation Units.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
Large Excavation Units - Direct Impact											
80-1209-360	S75.5E188	6.4 mm			3	2.7			1	1.0	
80-1209-360	S75.5E188	12.8 mm			7	71.8	2	18.8	1	3.2	
80-1209-372	S75.5E188 midden	6.4 mm	7	7.0	294	245.5					
80-1209-372	S75.5E188 midden	12.8 mm			93	526.0	13	124.3	9	26.0	
80-1209-376	S75.5E188 flotation	6.4 mm			4	1.0					
80-1209-127	S48.77 E157	6.4 mm			8	7.6					
80-1209-127	S48.77E157	12.8 mm			9	69.0			1	6.2	
80-1209-129	S48.77 E157	6.4 mm	12	11.0	217	138.5					
80-1209-129	S48.77 E157	12.8 mm	3	20.0	50	258.0	7	111.0			
80-1209-529	S48.77E157 3x3m	12.8 mm			2	27.8					
80-1209-874	S48.77E157 backdirt surface	6.4 mm			2	3.0					
80-1209-874	S48.77E157 backdirt surface	12.8 mm			4	111.3	2	43.0	1	5.0	
80-1209-124	S49.27E159 20-30 cm	6.4 mm			7	3.0					
80-1209-124	S49.27E159 20-30 cm	12.8 mm			1	2.4	2	17.5			
80-1209-135	S51.10E157.16 0-10 cm	6.4 mm			3	0.6					
80-1209-136	S51.10E157.16 10-20 cm	6.4 mm			2	0.6					
80-1209-137	S51.10E157.16 20-30 cm	6.4 mm			1	0.1					
80-1209-331	S29.27E161 Levee wash 2x2m unit	12.8 mm			1	3.7					
80-1209-333	S79.27E161 midden	6.4 mm			5	1.5					
80-1209-333	S79.27E161 midden	12.8 mm			2	8.6					
80-1209-334	S79.27E161 midden	12.8 mm					1*	11.7			* Not BP
80-1209-16	S42E178 overburden	6.4 mm			5	3.3					
80-1209-16	S42E178 overburden	12.8 mm			9	79.0	4	36.6			* 1 of 4 is clearly bipolar
80-1209-337	S42E178 3x3m midden	6.4 mm	3	2.5	185	120.5			1	2.4	
80-1209-337	S42E178 3x3m midden	12.8 mm	2	15.0	55	260.0	12	108.5	2	6.7	
80-1209-338	S42.50E179.50 CS 0-10 cm	6.4 mm	2	2.4	1	0.1					
80-1209-338	S42.50E179.50 CS 0-10cm	12.8 mm			1	3.3	1	20.9			

Appendix 20-5 continued. Lithic Debris from 3LA97 Mitigation: Large Excavation Units.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone, etc. #	Nonchert wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-339	S42.50E179.50 CS 10-20 cm	6.4 mm			3	0.9					
80-1209-339	S42.50E179.50 CS 10-20 cm	12.8 mm			2	4.7	1	2.0			
80-1209-340	S42.50E179.50 CS 20-30 cm	6.4 mm			1	0.2					
80-1209-34	S42E181 midden	6.4 mm			4	6.5					
80-1209-34	S42E181 midden	12.8 mm			3	11.0	1*	6.5			* core nuclei Not BP
80-1209-33	S45E181 midden	6.4 mm			4	2.5					
80-1209-33	S45E181 midden	12.8 mm			3	24.3					
80-1209-35	S51E181 0-60 cmbs.	6.4 mm			6	3.0					
80-1209-35	S51E181 0-60 cmbs.	12.8 mm	1	4.7	7	35.0	2*	38.0			* core nuclei " : BP
80-1209-52	S54E184 S51E184	<6.4 mm			2	0.8					
80-1209-52	S54E184 S51E184	6.4 mm			4	1.8					
		Large Excavation Units - Indirect Impact									
80-1209-1023	Trench S140.84E138 midden	6.4 mm			2	2.8			2	1.9	
80-1209-1024	Trench S140.84E 142.50 midden	12.8 mm			1	7.8					
80-1209-1026	Trench S141.40E127 midden	6.4 mm			2	0.8					
80-1209-1027	Trench S140.84E133 overburden midden	6.4 mm			1	0.9					
80-1209-1027	Trench S140.84E133 midden	12.8 mm			4	40.3					
80-1209-1327	Caddo IV component	12.8 mm			6	192.0		20.8			
80-1209-1328	Caddo IV component	6.4 mm			61	33.0					
80-1209-1328	Caddo IV component	12.8 mm			20	148.7		11.5			+ 3 chert cobbles 153.2g
80-1209-1300	inside house S of road	6.4 mm			2	2.1					
80-1209-1300	inside house S of road	12.8 mm	2	303.0	9	107.3	1	7.0	1	6.8	+ 1 chert cobble 23.8g

6. Lithic Debris from 3LA97 Mitigation: Random Column Samples.

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone, etc.		Chert Shatter/ Debitage		Chert Bipolar Nuclei/core		Chert edge Damage flakes		Other ?
			#	wt. (g)	#	wt. (g)	#	wt. (g)	#	wt. (g)	
80-1209-386	E154S60 CS Cut 2 10-20 cm	6.4 mm			1	0.1					
80-1209-388	E154S60 CS Cut 3 20-30 cm	6.4 mm			2	1.3					
80-1209-390	E154S60 CS Cut 4 30-40 cm	6.4 mm			1	0.6					
80-1209-390	E154S60 CS 30-40 cm	12.8 mm			1	9.4					
80-1209-174	E154S64 CS 20-30 cm	12.8 mm			1	6.0					
80-1209-191	E154S64 SC 30-40 cm	6.4 mm			1	0.1					
80-1209-193	E154S64 SC 41-50 cm	6.4 mm			1	0.2					
80-1209-202	E154S64 SC 50-60 cm										
80-1209-415	E1154S64 CS 50-60 cm	6.4 mm			1	0.1					
80-1209-501	E154S64 CS 60-70 cm										unknown material
80-1209-503	E154S64 CS 70-80 cm	6.4 mm			1	0.1					
80-1209-497	S78E154 CS 0-10 cm	6.4 mm			1	0.2					
80-1209-369	S59E157 CS 40-50 cm	6.4 mm									
80-1209-387	E157S59 CS Cut 1 0-10 cm	6.4 mm			1	0.1					
80-1209-389	E157S59 CS Cut 2 10-20 cm	6.4 mm	2	1.2							
80-1209-413	E157S59 CS 30-40 cm	6.4 mm			1	1.1					
80-1209-355	S49E162 0-10 cm	6.4 mm			1	0.1					
80-1209-469	S49E162 Hist. grave shaft 10-20 cm	6.4 mm			1	0.6					
80-1209-469	S49E162 Hist. grave shaft 10-20 cm	12.8 mm			1	32.8					
80-1209-484	S49E162 CS 20-30 cm	6.4 mm			1	0.1					
80-1209-157	E162S76 CS 20-30 cm	6.4 mm			1	1.0					
80-1209-491	S39E164 CS 0-10 cm	12.8 mm			1	2.7					
80-1209-364	S43E164 CS 20-30 cm	6.4 mm			5	2.5					
80-1209-364	S43E164 CS 20-30 cm	12.8 mm			2	77.0					
80-1209-452	S43E164 CS 30-40 cm	6.4 mm	1	0.2	2	0.6					
80-1209-452	S43E164 CS 30-40 cm	12.8 mm			1	4.0	1	38.5			

6 continued. Lithic Debris from 3LA97 Mitigation: Random Column Samples.

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone, etc.		Chert Shatter/ Debitage		Chert Bipolar Nuclei/core		Chert edge Damage flakes		Other ?
			#	wt. (g)	#	wt. (g)	#	wt. (g)	#	wt. (g)	
80-1209-246	E164S76 CS 10-20 cm	6.4 mm			1	0.1					
80-1209-246	E164S76 CS 10-20 cm	12.8 mm			2	10.0					
80-1209-383	E164S76 Cut 3 CS 20-30 cm	6.4 mm			1	1.7					
80-1209-385	E164S76 Cut 4 CS 30-40 cm	6.4 mm			1	0.1					
80-1209-314	S41E168 CS 0-10 cm	6.4 mm			1	0.2					
80-1209-321	S41E168 CS 10-20 cm	6.4 mm			1	0.2					
80-1209-321	S41E168 CS 10-20 cm	12.8 mm			4	19.3	1	12.0			
80-1209-324	S41E168 CS 20-30 cm	6.4 mm			10	4.5					
80-1209-326	S41E168 CS 30-40 cm	6.4 mm			5	3.5					
80-1209-326	S41E168 CS 30-40 cm	12.8 mm			2	11.6					
80-1209-462	S41D168 CS-surface	25.6 mm									No artifacts in box
80-1209-176	E168S63 CS 0-10 cm	12.8 mm			1	2.0					
80-1209-175	E168S75 CS 0-10 cm	6.4 mm			2	0.7					
80-1209-204	E168S75 SC 20-30 cm	6.4 mm	1	1.7	1	0.4					
80-1209-206	E168S75 SC 30-40 cm	6.4 mm			1	1.0					
80-1209-232	E168S75 CS 40-50 cm	6.4 mm	1	0.4							
80-1209-156	E168S78 CS 0-10 cm	12.8 mm			2	5.0					
80-1209-165	E168S78 CS 20-30 cm	6.4 mm			1	0.1					
80-1209-165	E168S78 CS 20-30 cm	12.8 mm	1	13.7							
80-1209-166	E157S69 CS 40-50 cm	6.4 mm			1	0.1					
80-1209-168	E168S78 CS 30-40 cm	12.8 mm			1	2.8					
80-1209-173	E168S78 CS 40-50 cm	6.4 mm			4	1.3					
80-1209-306	S40E175 CS 0-10 cm	6.4 mm			5	4.8					
80-1209-306	S40E175 CS 0-10 cm	12.8 mm			1	3.3					
80-1209-315	S40E175 CS 10-20 cm	6.4 mm			1	0.1					
80-1209-329	S57E175 CS 0-10 cm	6.4 mm			4	1.8					
80-1209-195	E175S65 SC 0-10 cm	6.4 mm			2	0.6					
80-1209-197	E175S65 SC 10-20 cm	6.4 mm			1	0.4					
80-1209-197	E175S65 SC 10-20 cm	12.8 mm			1*	5.0					*pieces esquillees
80-1209-198	E178S65 SC 20-30 cm	6.4 mm			5	1.7					
80-1209-201	E175S65 SC 30-40 cm	6.4 mm			2	0.6					
80-1209-416	E175S65 CS 50-60 cm	6.4 mm	1	0.8	2	0.7					
80-1209-502	E175S65 CS 60-70 cm	6.4 mm			3	1.1					
80-1209-502	#175S65 CS 60-70 cm	12.8 mm			1	2.1					

6 continued. Lithic Debris from 3LA97 Mitigation: Random Column Samples.

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-268	S80E175 CS 0-10 cm	12.8 mm			1	9.1	1	7.9			
80-1209-268	S80E175 CS 0-10 cm	6.4 mm			5	3.3					
80-1209-276	S80E175 CS 10-20 cm	6.4 mm			1	0.1					
80-1209-276	S80E175 CS 10-20 cm	12.8 mm			1	5.6	1	6.7			
80-1209-281	S80E175 CS 20-30 cm	6.4 mm			1	0.6					
80-1209-281	S80E175 CS 20-30 cm	12.8 mm			1	4.6					
80-1209-283	S83E175 CS 20-30 cm	6.4 mm			5	1.3					
80-1209-291	S83E175 CS 30-40 cm	6.4 mm			1	0.8					
80-1209-200	E179S61 SC 0-10 cm	6.4 mm			17	9.0					
80-1209-200	E179S61 SC 0-10 cm	12.8 mm			1	3.0	3	14.0			
80-1209-205	E179S61 SC 10-20 cm	6.4 mm			23	12.7					
80-1209-205	E179S61 SC 10-20 cm	12.8 mm			1	1.2	1	13.5			
80-1209-208	E179S61 SC 20-30 cm	6.4 mm			26	11.5					
80-1209-208	E179S61 SC 20-30 cm	12.8 mm			1	1.1			1	3.2	
80-1209-230	E179S61 CS 30-40 cm	6.4 mm			2	0.2					
80-1209-231	E179S61 CS 40-50 cm	6.4 mm			1	0.3					
80-1209-304	S63E179 CS 0-10 cm	6.4 mm			7	4.0					
80-1209-310	S63E179 CS 10-20 cm	6.4 mm	2	1.5	4	2.6					
80-1209-313	S63E179 CS 20-30 cm	6.4 mm			5	4.3					
80-1209-313	S63E179 CS 20-30 cm	12.8 mm			2	4.2					
80-1209-323	S63E179 CS 30-40 cm	6.4 mm			5	2.5					
80-1209-323	S63E179 CS 30-40 cm	12.8 mm			2	3.5					
80-1209-325	S63E179 CS 40-50 cm	6.4 mm	1	0.1	13	6.0					
80-1209-325	S63E179 CS 40-50 cm	12.8 mm			1	3.2	2	6.5			
80-1209-328	S63E179 CS 50-60 cm	6.4 mm			8	3.0					
80-1209-328	S63E179 CS 50-60 cm	12.8 mm			2	6.7			1	2.7	
80-1209-332	S63E179 CS 60-70 cm	6.4 mm	1	0.5	17	7.0					
80-1209-332	S63E179 CS 60-70 cm	12.8 mm	1	15.6	1	4.3					
80-1209-335	S63E179 CS 70-80 cm	6.4 mm			2	0.2					
80-1209-229	E179S68 CS 10-20 cm	6.4 mm			4	1.5					
80-1209-242	E179S68 CS 20-30 cm	6.4 mm			2	1.0					
80-1209-244	E179S68 CS 30-40 cm	6.4 mm			1	0.1					
80-1209-244	E179S68 CS 30-40 cm	12.8 mm			1	2.5					
80-1209-381	E179S68 CS 40-50 cm Cut 5	6.4 mm			4	1.7					
80-1209-252	S71E179 CS 0-10 cm	6.4 mm			1	1.2					
80-1209-252	S71E179 CS 0-10 cm	12.8 mm			1*	5.4					* bipolar flake

5 continued. Lithic Debris from 3LA97 Mitigation: Random Column Samples.

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone,etc.		Chert Shatter/ Debitage		Chert Bipolar Nuclei/core		Chert edge Damage flakes		Other ?
			#	wt. (g)	#	wt. (g)	#	wt. (g)	#	wt. (g)	
80-1209-256	S71E179 CS 10-20 cm	6.4 mm			3	2.9					
80-1209-260	S71E179 CS 20-30 cm	6.4 mm			2	0.5					
80-1209-265	S71E179 CS 30-40 cm	6.4 mm			1	0.1					
80-1209-265	S71E179 CS 30-40 cm	12.8 mm			1	4.3	1	9.8			
80-1209-270	S71E179 CS 40-50 cm	6.4 mm			2	1.3					
80-1209-181	S75E179 surface	6.4 mm			1	0.8					
80-1209-182	S75E179 CS 40-50 cm	6.4 mm			4	1.1					
80-1209-182	S75E179 CS 40-50 cm	12.8 mm			1	5.0					
80-1209-183	S75E179 CS 50-60 cm	6.4 mm	1	1.3	1	1.2					
80-1209-272	S81E179 CS 10-20 cm	12.8 mm			1	3.0					
80-1209-275	S81E179 CS 20-30 cm	6.4 mm			4	2.2					
80-1209-275	S81E179 CS 20-30 cm	12.8 mm			1	3.8					
80-1209-281	S87E179 CS 10-20 cm	6.4 mm			2	0.2					
80-1209-522	S38E181 CS 0-10 cm	6.4 mm			4	1.3					
80-1209-523	S38E181 CS 10-20 cm	6.4 mm			2	0.5					
80-1209-228	S54E181 CS 0-10 cm	6.4 mm			9	7.1					
80-1209-228	S54E181 CS 0-10 cm	12.8 mm			2	4.8	2	15.2	1	4.4	
80-1209-307	S54E181 CS 10-20 cm	6.4 mm			9	5.2					
80-1209-307	S54E181 CS 10-20 cm	12.8 mm			2	7.9					
80-1209-309	S54E181 CS 20-30 cm	6.4 mm			10	3.1					
80-1209-309	S54E181 CS 20-30 cm	12.8 mm			4	16.3					
80-1209-316	S54E181 CS 30-40 cm	6.4 mm			5	2.3					
80-1209-316	S54E181 CS 30-40 cm	12.8 mm			1	11.1					
80-1209-187	S75E181 CS 0-10 cm	6.4 mm			1	0.6					
80-1209-189	S75E181 CS 10-20 cm	6.4 mm			1	0.1					
80-1209-189	S75E181 CS 10-20 cm	12.8 mm	1	12.7							
80-1209-190	S75E181 CS 20-30 cm	6.4 mm			3	1.3					
80-1209-261	S75E181 CS 30-40 cm	6.4 mm			1	0.2					
80-1209-261	S75E181 CS 30-40 cm	12.8 mm			1	2.5					
80-1209-278	S85E181 CS 0-10 cm	6.4 mm			1	1.3					
80-1209-254	S69E184 CS 10-20 cm	6.4 mm			1	1.8					
80-1209-257	S69E184 CS 20-30 cm	6.4 mm			1	0.5					
80-1209-259	S69E184 CS 30-40 cm	6.4 mm			11	7.0					
80-1209-259	S69E184 CS 30-40 cm	12.8 mm			1	1.9	1	23.5			
80-1209-269	S69E184 CS 40-50 cm	6.4 mm			1	0.5					
80-1209-185	S73E184 CS 0-10 cm	6.4 mm			1	0.1					
80-1209-185	S73E184 CS 0-10 cm	12.8 mm			1	6.0					
80-1209-188	S73E184 CS 10-20 cm	6.4 mm			2	2.0					

6 continued. Lithic Debris from 3LA97 Mitigation: Random Column Samples

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone,etc.		Chert Shatter/ Debitage		Chert Bipolar Nuclei/core		Chert edge Damage flakes		Other ?
			#	wt. (g)	#	wt. (g)	#	wt. (g)	#	wt. (g)	
80-1209-255	S73E184 CS 20-30 cm	6.4 mm			8	4.6					
80-1209-181	S75E179 surface	6.4 mm			1	0.8					
80-1209-182	S75E179 CS 40-50 cm	6.4 mm			4	1.1					
80-1209-182	S75E179 CS 40-50 cm	12.8 mm			1	5.0					
80-1209-183	S75E179 CS 50-60 cm	6.4 mm	1	1.3	1	1.2					
80-1209-272	S81E179 CS 10-20 cm	12.8 mm			1	3.0					
80-1209-275	S81E179 CS 20-30 cm	6.4 mm			4	2.2					
80-1209-275	S81E179 CS 20-30 cm	12.8 mm			1	3.8					
80-1209-281	S87E179 CS 10-20 cm	6.4 mm			2	0.2					
80-1209-522	S38E181 CS 0-10 cm	6.4 mm			4	1.3					
80-1209-523	S38E181 CS 10-20 cm	6.4 mm			2	0.5					
80-1209-228	S54E181 CS 0-10 cm	6.4 mm			9	7.1					
80-1209-228	S54E181 CS 0-10 cm	12.8 mm			2	4.8	2	15.2	1	4.4	
80-1209-307	S54E181 CS 10-20 cm	6.4 mm			9	5.2					
80-1209-307	S54E181 CS 10-20 cm	12.8 mm			2	7.9					
80-1209-309	S54E181 CS 20-30 cm	6.4 mm			10	3.1					
80-1209-309	S54E181 CS 20-30 cm	12.8 mm			4	16.3					
80-1209-316	S54E181 CS 30-40 cm	6.4 mm			5	2.3					
80-1209-316	S54E181 CS 30-40 cm	12.8 mm			1	11.1					
80-1209-187	S75E181 CS 0-10 cm	6.4 mm			1	0.6					
80-1209-189	S75E181 CS 10-20 cm	6.4 mm			1	0.1					
80-1209-189	S75E181 CS 10-20 cm	12.8 mm	1	12.7							
80-1209-190	S75E181 CS 20-30 cm	6.4 mm			3	1.3					
80-1209-261	S75E181 CS 30-40 cm	6.4 mm			1	0.2					
80-1209-261	S75E181 CS 30-40 cm	12.8 mm			1	2.5					
80-1209-278	S85E181 CS 0-10 cm	6.4 mm			1	1.3					
80-1209-254	S69E184 CS 10-20 cm	6.4 mm			1	1.8					
80-1209-257	S69E184 CS 20-30 cm	6.4 mm			1	0.5					
80-1209-259	S69E184 CS 30-40 cm	6.4 mm			11	7.0					
80-1209-259	S69E184 CS 30-40 cm	12.8 mm			1	1.9	1	23.5			
80-1209-269	S69E184 CS 40-50 cm	6.4 mm			1	0.5					
80-1209-185	S73E184 CS 0-10 cm	6.4 mm			1	0.1					
80-1209-185	S73E184 CS 0-10 cm	12.8 mm			1	6.0					
80-1209-140	S74E184 CS 0-10 cm	6.4 mm			1	1.7					
80-1209-247	S74E184 CS 10-20 cm	6.4 mm			2	0.8					
80-1209-247	S74E184 CS 10-20 cm	12.8 mm			1	2.2					
80-1209-248	S74E184 CS 20-30 cm	6.4 mm			4	2.0					
80-1209-253	S74E184 CS 30-40 cm	6.4 mm			6	2.3					

6 continued. Lithic Debris from 3LA97 *Mitigation:* Random Column Samples

3LA97 Lithic Debris Catalog #	Column Samples Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/core #	wt. (g)	Chert edge *Damage flakes* #	wt. (g)	Other ?
80-1209-253	S74E184 CS 30-40 cm	12.8 mm			1	1.8					
80-1209-420	S54E190 CS 0-10 cm	6.4 mm			3	1.5					
80-1209-422	S75E192 CS 0-10 cm	6.4 mm			5	3.0					
80-1209-422	S75E192 CS 0-10 cm	12.8 mm			3	14.0					
80-1209-424	S75E192 CS 10-20 cm	6.4 mm			1	0.5					
80-1209-424	S75E192 CS 10-20 cm	12.8 mm			1	1.8					
80-1209-481	S81E209 CS 0-10 cm	6.4 mm			2	1.3					
80-1209-481	S81E209 CS 0-10 cm	12.8 mm			1	1.3					
80-1209-486	S81E209 CS 10-20 cm	6.4 mm			1	0.9					* 1 pebble 1.8
80-1209-474	S83E209 CS 0-10 cm	6.4 mm			1	0.2					
80-1209-474	S83E209 CS 0-10 cm	12.8 mm			1	1.3					
80-1209-483	S83E209 CS 10-20 cm	6.4 mm			3	1.3					
80-1209-483	S83E209 CS 10-20 cm	12.8 mm			1	3.9	1	6.9			
80-1209-483	S83E209 CS 20-30 cm	6.4 mm			2	1.5					
80-1209-500	S83E209 CS 30-40 cm	6.4 mm			1	0.3					
80-1209-368	S77E214 CS 0-10 cm	6.4 mm			3	4.0					
80-1209-373	S88E214 CS 0-10 cm	6.4 mm			1	0.1					
80-1209-461	S88E214 CS 10-20 cm	6.4 mm			1	0.4					
80-1209-461	S88E214 GS 10-20 cm	12.8 mm			1	4.6					
80-1209-471	S70E218 Hist. grave shaft 0-10 cm	6.4 mm			1	1.0					
80-1209-482	S70E218 CS 20-30 cm	6.4 mm			4	3.6					
80-1209-488	S75E218 Hist. grave shaft 10-20 cm	6.4 mm			1	0.9					
80-1209-375	S68E222 CS 0-10 cm	6.4 mm	1	1.0	2	0.7					
80-1209-375	S68E222 CS 0-10 cm	12.8 mm			1	9.6					
80-1209-453	S68E222 CS 10-20 cm	6.4 mm			1	0.3					

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial

B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

7. Lithic Debris from 3LA97 Mitigation: Features.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone, etc.		Chert Shatter/ Debitage		Chert Bipolar Nuclei/core		Chert edge Damage flakes		Other ?
			#	wt. (g)	#	wt. (g)	#	wt. (g)	#	wt. (g)	
80-1209-436	W. muck ditch fill S end of levee ditch	6.4 mm	3	1.0	92	71.6					
80-1209-436	W. muck ditch Fea. 1 S end of levee ditch fill	12.8 mm	2	10	25	162.5	4	55.0	6	19.0	+ 1 chert cobble 20.0g
80-1209-446	W. muck ditch W of LT Units 7 & 8 surface	6.4 mm	3	4.2	106	56.6			3	3.7	
80-1209-446	W muck ditch surface W of LT Units 7 & 8	12.8 mm			24	103.8	5	52.0	4	11.5	
80-1209-448	Fea. 1 surface W of TU 6 & 7 W muck ditch	12.8 mm					5	78.0			
80-1209-544	W muck ditch from S wall surface Backhoe Trench 2 to S85 line	6.4 mm	4	4.0	74	53.0					
80-1209-544	W muck ditch from S wall surface Backhoe Trench 2 + S85 line	12.8 mm			38	138.7	3	52.8			
80-1209-19	B.T. No.1 (345) Fea. 2 H. Levee	12.8 mm			2	8.3					
80-1209-22	B.T. No.1 (345) Fea. 2 H. Levee	6.4 mm	1	0.7	2	4.5					
80-1209-22	B.T. No.1 (345) Fea. 2 H. Levee	12.8 mm	1	2.4			1	36.2			+ 1 edge retouched cobble 25.0g
80-1209-630	Feature 7	6.4 mm			2	0.9					
80-1209-630	Feature 7	12.8 mm			1	4.7					
80-1209-631	Feature 6	6.4 mm			6	3.5					
80-1209-631	Feature 6	12.8 mm			2	36.8			1	2.0	
80-1209-628	Feature 9	6.4 mm			4	0.9					
80-1209-628	Feature 9	12.8 mm			1	1.9					
80-1209-1057	Feature 9	6.4 mm			5	1.5					
80-1209-1057	Feature 9	12.8 mm			1	4.8	1	14.9			
80-1209-675	Levee Trans. Unit 3 Feature 11	6.4 mm			5	2.6					

7 continued. Lithic Debris from 3LA97 Mitigation: Features.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/core #	wt. (g)	Chert edge Damage flakes #	wt. (g)	Other ?
80-1209-681	Levee Trans. Unit 2 Fea. 13	12.8 mm							1	12.0	
80-1209-1005	Feature 14 S141E130	6.4 mm			3	1.6					
80-1209-1005	Feature 14 S141E130	12.8 mm			2	6.1					
80-1209-1006	Feature 14	12.8 mm	1	301.0	1	1.3					
80-1209-1085	Feature 15	6.4 mm			1	2.5					
80-1209-1085	Feature 15	12.8 mm			3	19.6					
80-1209-1108	Feature 16 S of road	12.8 mm			1	2.8					
80-1209-1109	Feature 16 S of road	6.4 mm			1	0.1					
80-1209-1109	Feature 16 S of road	12.8 mm			1	2.5					
80-1209-1221	Feature 17 S144E130	6.4 mm			2	1.6					
80-1209-1438	Feature 17	6.4 mm			2	1.0					
80-1209-1438	Feature 17	12.8 mm	1	9.0	6	41.3					+ 1 chert cobble 8.3g
80-1209-1547	Feature 17 S144E130	6.4 mm			6	4.3					
80-1209-1547	Feature 17 S144E130	12.8 mm	1	116.7	13	116.5					
30-1209-1379	Area Fea. 18 + PM 71	6.4 mm			2	1.5					
80-1209-1379	Area Fea. 18 + PM 71	12.8 mm			1	10.5					
80-1209-1380	Feature 18	1˙ 8 mm	4	104.8							
80-1209-1381	Feature 18	6.4 mm			3	1.5					
80-1209-1381	Feature 18	12.8 mm			2	10.0					
80-1209-1401	Feature 18 W ½ flot	6.4 mm	1	0.2	7	3.5					
80-1209-1401	Feature 18 W ½ flot	12.8 mm			2	3.1					
80-1209-1448	Feature 18	6.4 mm			1	1.5					
80-1209-1448	Feature 18	12.8 mm			4	22.7					

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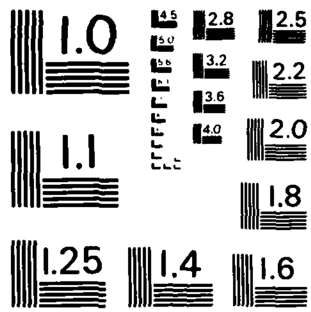

MICROCOPY RESOLUTION TEST CHART
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7 continued. Lithic Debris from 3LA97 Mitigation: Features.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/core #	wt. (g)	Chert edge Damage flakes #	wt. (g)	Other ?
80-1209-1452	Feature 18	12.8 mm			1	0.5					
80-1209-1382	PM 71 - Fea. 18	6.4 mm			3	4.5					
80-1209-1385	PM 71 - Fea. 18	6.4 mm			9	6.8					
80-1209-1385	PM 71 - Fea. 18	12.8 mm	1	114.2	5	28.0			1	6.4	
80-1209-1083	Fea. 20 N of S140.84 E133	6.4 mm	1	0.7	3	2.6					
80-1209-1083	Fea. 20 N of S140.84 E133	12.8 mm			1	1.6					
80-1209-1105	Fea. 20 Exp. Unit N of S140.84E133	12.8 mm					1*	18.0			* Not BP
80-1209-20	B.T. No. 1(345) Fea. 22 E. muck ditch	6.4 mm			1	1.7					
80-1209-20	B.T. No. 1(345) Fea. 22 E. muck ditch	12.8 mm			2	6.0					
80-1209-438	S Wall BHT 1 to S85 line Fea. 22	6.4 mm			116	79.5					
80-1209-438	S Wall BHT 1 to S85 line Fea. 22	12.8 mm	1	11.7	29	136.2	10	108.2	4	10.5	
80-1209-545	E. muck ditch S of Unit 12 to N Wall of Backhoe Trench 1 surface	6.4 mm	7	4.6	260	171.2					
80-1209-545	E muck ditch S of Unit 12 to N Wall of Backhoe Trench 1 surface	12.8 mm	1	5.8	100	592.5	11	141.8	3	11.0	+ 1 chert cobble 8.7g

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial

B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

8. Lithic Debris from 3LA97 Mitigation: Post Molds:

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-1036	Post Mold 5	6.4 mm			1	0.7					
80-1209-430	Post Mold 6	6.4 mm			6	4.1					
80-1209-430	Post Mold 6	12.8 mm			4	17.8	2	32.0			* 1 hammerstone oqz. flake
80-1209-913	W of LT Adj. to Post Mold 6	12.8 mm									+ 1 chert cobble 41.0g
80-1209-914	W of Lt Post Mold 6	6.4 mm			3	2.8					
80-1209-747	Post Mold 7 fill	6.4 mm			2	0.2					
80-1209-635	Post Mold 13	6.4 mm			1	1.7					
80-1209-635	Post Mold 13	12.8 mm					1	23.0			
80-1209-962	Post Mold 17	12.8 mm			1	13.1					
80-1209-965	Post Mold 18										No artifacts
80-1209-624	East of Levee Post Mold 19	6.4 mm			1	0.5			1	0.8	
80-1209-624	East of Levee Post Mold 19	12.8 mm			1	8.3	1	7.6			
80-1209-967	Post Mold 19	6.4 mm			1	0.5					
80-1209-967	Post Mold 19	12.8 mm			1	4.8					
80-1209-643	Post Mold 22	6.4 mm			1	0.2					
80-1209-1051	East of Levee Post Mold 23	12.8 mm			1	2.4					
80-1209-645	Post Mold 24	6.4 mm			2	0.3					
80-1209-649	East of Levee Post Mold 25	6.4 mm			2	1.3					
80-1209-649	East of Levee Post Mold 25	12.8 mm			2	19.0					
80-1209-959	Post Mold 25	6.4 mm			3	1.8					
80-1209-959	Post Mold 25	12.8 mm			1	8.0					
80-1209-651	East Of Levee Post Mold 27	6.4 mm			1	1.2					
80-1209-653	East of Levee Post Mold 29	6.4 mm			2	1.1					
80-1209-653	East of Levee Post Mold 29	12.8 mm			2	11.5					
80-1209-951	East of Levee Post Mold 29	6.4 mm			1	1.3					

8 continued. Lithic Debris from 3LA97 Mitigation: Post Molds.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	wt. (g)	Chert Shatter/ Debitage #	wt. (g)	Chert Bipolar Nuclei/core #	wt. (g)	Chert edge Damage flakes #	wt. (g)	Other ?
80-1209-654	East of Levee Post Mold 30	6.4 mm			3	1.2					
80-1209-654	East of Levee Post Mold 30	12.8 mm			1	6.2	1	15.2			
80-1209-905	East of Levee Post Mold 30	6.4 mm			5	2.7					
80-1209-905	East of Levee Post Mold 30	12.8 mm			3	7.2	1*	33.0			* Not BP
80-1209-1061	Post Mold 33	6.4 mm			2	1.6					
80-1209-1065	Post Mold 43	6.4 mm			1	0.2					
80-1209-1076	East of Levee Post Mold 43	12.8 mm			1	2.7					
80-1209-1121	Post Mold 53	6.4 mm			1	.0.1					
80-1209-1121	Post Mold 53	12.8 mm					1*	14.1			* Not BP
80-1209-1392	Post Mold 69	12.8 mm			1	1.8					
80-1209-1397	Post Mold 73	6.4 mm	4	1.0							

9. Lithic Debris from 3LA97 Testing: Aboriginal Burials.

3LA97 Lithic Debris Catalog #	Provenience	Size Grade in mm	Nonchert sandstone,etc. #	Nonchert sandstone,etc. wt. (g)	Chert Shatter/ Debitage #	Chert Shatter/ Debitage wt. (g)	Chert Bipolar Nuclei/core #	Chert Bipolar Nuclei/core wt. (g)	Chert edge Damage flakes #	Chert edge Damage flakes wt. (g)	Other ?
80-1209-597	Burial 1 grave fill	12.8 mm			1	5.7					
80-1209-618	Burial 1	6.4 mm			9	7.0					
80-1209-618	Burial 1	12.8 mm	1	39.0	11	94.0	2	30.3			
80-1209-622	Burial 2	6.4 mm			14	6.8					
80-1209-622	Burial 2	12.8 mm			2	27.5	1*	53.0	1	1.0	* Not BP
80-1209-720	S68E175 Burial 3	12.8 mm			2	11.9					
80-1209-721	S68E175 Burial 3	12.8 mm			1	4.3					
80-1209-686	HB42 fill Burial 3	6.4 mm			24	15.8					
80-1209-686	HB42 fill Burial 3	12.8 mm			11	77.3					
80-1209-719	S62E175 Burial 4	12.8 mm			1	9.2					
80-1209-840	Burial 4 S68E175 grave fill	6.4 mm			4	1.0					
80-1209-840	Burial 4 S68E175 grave fill	12.8 mm			1	2.5					
80-1209-1241	Burial 5	12.8 mm			1	4.0					
80-1209-685	HB66 fill Burial 6	6.4 mm			10	4.3					
80-1209-685	HB66 fill Burial 6	12.8 mm			2	11.1					
80-1209-749	Burial 7 Exposure Unit	6.4 mm			1	4.4					
80-1209-1166	Burial 9	6.4 mm			3	2.0					
80-1209-1166	Burial 9	12.8 mm			1	6.5	2*	47.2			* Not BP
80-1209-1167	Burial 9	6.4 mm			1	0.2					
80-1209-1159	Burial 10	6.4 mm			1	0.3					
80-1209-1159	Burial 10	12.8 mm			1	4.0					+ 1 chert pebble 3.2g
80-1209-1256	Burial 14	6.4 mm			1	0.8					

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial

B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

10. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Pieces Esquilles	80-1209-112	Levee Transect Unit 9 midden	1		
"	80-1209-141	Levee Transect Unit 2 midden	1		
"	80-1209-142	Levee Transect Unit 9 all levels	1		
"	80-1209-223	Levee Transect Unit 8 CS 0-10 cm	1		
"	80-1209-226	Levee Transect Unit 8 midden	3		
"	80-1209-337	S42 E178 midden	2		
"	80-1209-372	S75.5 E188 midden	2		
"	80-1209-436	Feature 1 W. Muck Ditch S End of levee fill	3		
"	80-1209-446	Feature 1 W. Muck Ditch W of LT Units 7&8 surface	1		
"	80-1209-532	Midden between levee & waterscreen trench	1		
"	80-1209-550	Levee Transect Unit 3 midden	1		
"	80-1209-623	Levee Transect Unit 14 fill & midden	1		
"	80-1209-674	Levee Transect Unit 1 fill	1		
"	80-1209-679	Levee Transect Unit 0 fill	1		
Edge Retouched Cobble	80-618-1	surface	1		
"	80-622-1	surface	1		
"	80-1108-1-3	surface	1		
"	80-1108-25-2	Test Unit 6 Level 1	1		
"	80-1108-40-7	surface	6		
"	80-1108-58-2	Feature 2 NS Trench	2		
"	80-1108-59-12	Feature 3 NS Trench 4	1		
"	80-1209-11	General Site Col. during stripping	1		
"	80-1209-18	S54 E184	3		
"	80-1108-29	Test Unit 1	1		
"	80-1209-31	Levee Transect Unit 12 midden	1		
"	80-1209-32	Levee Transect Unit 11 midden	1		
"	80-1209-58	S72 E212 midden	1		
"	80-1209-63	Ext. of BT 2 at E end S54.92E179.45	1		
"	80-1209-64	S57 E184 Gen. Exc. profile trenches	2		
"	80-1209-70	S54 E184 midden	2		
"	80-1209-102	S55E155.4 stratum 34 N Wall	1		
"	80-1209-112	Levee Transect Unit 9 midden	3		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Edge Retouched Cobble	80-1209-120	Levee Transect Unit 2 fill	1		
"	80-1209-127	S48.77E157 General Excavation	2		
"	80-1209-141	Levee Transect Unit 2 midden	1		
"	80-1209-148	Levee Transect Unit 2 midden	2		
"	80-1209-215	Levee Transect Unit 10 fill	1		
"	80-1209-226	Levee Transect Unit 8 midden	2		
"	80-1209-298	S78.5E191 General Excavation	1		
"	80-1209-299	S78.5E191 General Excavation	1		
"	80-1209-320	Levee Transect Unit 10 midden	1		
"	80-1209-372	S75.5E188 midden	6		
"	80-1209-432	Levee Transect handpicked overburden	1		
"	80-1209-433	S end of levee S of Unit 12 midden	2		
"	80-1209-438	S Wall of BT 1 to S 85 line	2		
"	80-1209-439	Levee Transect Unit 7 overburden/ fill	5		
"	80-1209-446	West Muck Ditch West of Levee Transect Units 7&8	1		
"	80-1209-483	CS S83E209 10-20 cm	1		
"	80-1209-532	Midden between levee & waterscreen trench	7		
"	80-1209-533	Midden backdirt pile from E of levee	4		
"	80-1209-537	Midden West of levee transect	5		
"	80-1209-538	Midden backdirt pile West Levee	2		
"	80-1209-1005	Feature 14 S141 E130	1		
"	80-1209-540	Midden East of waterscreen trench	1		
"	80-1209-542	Due West of Powell Grave S of BT 3	2		
"	80-1209-544	W Muck Ditch from S Wall of BT 2 to S85 line	3		
"	80-1209-548	Levee Transect Unit 3 fill	2		
"	80-1209-550	Levee Transect Unit 3 midden	4		
"	80-1209-552	E185 S72.5 midden	2		
"	80-1209-591	Levee Transect Unit 5 midden	1		
"	80-1209-671	Levee Transect Unit 4 midden	1		
"	80-1209-674	Levee Transect Unit 1 fill	6		
"	80-1209-679	Levee Transect Unit 0 fill	1		
"	80-1209-680	Levee Transect Unit 0 midden	1		
"	80-1209-684	Levee Transect Unit 0 midden	1		
"	80-1209-689	West of W. Muck Ditch S of BT 1	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Edge Retouched Cobble	80-1209-719	Burial 4	1		
"	80-1209-744	Levee Transect East side overburden/ fill	1		
"	80-1209-772	Burial 8			
"	80-1209-1005	Feature 14 S141 E130	1		
"	80-1209-1008		1		
"	80-1209-1028	Trench S141.40E130 midden/ overburden	2		
"	80-1209-1030	S&E of S141E130 Exploratory Unit	2		
"	80-1209-1033	Exploratory Unit N of S144E133	1		
"	80-1209-1090	General surface & backdirt	1		
"	80-1209-1327	Caddo IV component midden	1		
"	80-1209-1379	Area Feature 18 & Post Mold 71 combined	1		
"	80-1209-1428	Approx. West S144E133 to S144E130 fill of HB 177 & 118 & midden	1		
Cobble Biface	80-1108-26-2	Test Unit 6	1		
"	80-1108-30	Test Unit 1 Level 2	1		
"	80-1108-35	Test Unit 5 Area 4 Post Mold	1		
"	80-1108-40-7	Surface	1		
"	80-1209-1	Whole site surface	1		
"	80-1209-30	Levee Transect Unit 11 fill	1		
"	80-1209-59	S72 E212 General Excavation	1		
"	80-1209-69	S54 E184 midden	1		
"	80-1209-121	Levee Transect Unit 6 midden	1		
"	80-1209-148	Levee Transect Unit 2 midden	1		
"	80-1209-205	CS 10-20 cm E179S61	1		
"	80-1209-504	Levee Transect Unit 5 fill	1		
"	80-1209-532	Midden between levee & waterscreen trench	3		
"	80-1209-536	Feature exposed E of E Muck Ditch Unit 8	1		
"	80-1209-537	Midden West of Levee Transect	1		
"	80-1209-671	Levee Transect Unit 4 midden	1		
"	80-1209-674	Levee Transect Unit 1 fill	2		
"	80-1209-875	General midden stripping	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Preform	80-618-1	Surface	1		
"	80-1209-58	S72 E217 midden	1		
"	80-1209-062	Ext. BT 2 E end S54.92E179.45	3		
"	80-1209-85	Levee Transect Unit 11 fill	1		
"	80-1209-432	Levee Transect overburden	1		
"	80-1209-438	S Wall BT 1 to S85 wall	1		
"	80-1209-674	Levee Transect Unit 1 fill	1		
"	80-1209-677	Levee Transect Unit 1 midden	1		
"	80-1209-1329	Levee Transect Unit 14	1		
Uniface, Utilize Flake, Burin on a Break, Flake Graver					
Uniface?	80-1209-278	CS S85E181 0-10 cm	1		
Utilized Flake	80-1209-1454	Surface	1		
Burin on a Break	80-1209-447	*Levee Transect Unit 7 midden*	1		
Flake Graver	80-1108-40	Surface	1		
Arrowpoint- Fresno	80-593	Surface	1		
"	80-1108-17-3	Test Unit 4	1		
"	80-1209-110	Levee Transect Unit 10 fill	1		
"	80-1209-462	S41 E168 CS surface	1		
"	80-1209-532	Midden between levee & waterscreen trench	1		
"	80-1209-671	Levee Transect Unit 4 midden	1		
"	80-1209-677	Levee Transect Unit 1 midden	1		
"	80-1209-1024	S140.84E142.50 midden	1		
Nodena	80-593	Surface	1		
"	80-1209-1140	Burial 7	1		
"	80-1209-17	Shovel scraped trench S48-57E181	1		
"	80-1209-58	S72 E212 midden	1		
"	80-1209-62	Ext. of BT 2 E end S54.92E179.45	2		
"	80-1209-220	Levee Transect Unit 8 fill	2		
"	80-1209-558	BT 3 N Wall E170S42 Stratum 4	1		
Mauel	80-1209-34	S42 E181 midden	1		
"	80-1209-141	Levee Transect Unit 2 midden	1		
"	80-1209-1047	Burial 12	1		
Scallorn	80-1108-4-5	Test Unit 1	1		
"	80-1108-40-8	Surface	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
A owhead - Scallorn	80-1209-63	Ext. of BT 2 E end S54.92	1		
"	80-1209-112	Levee Transect Unit 9 midden	1		
"	80-1209-121	Levee Transect Unit 6 midden	1		
"	80-1209-122	Levee Transect Unit 2 fill	1		
"	80-1209-431	Cleaning operations S of levee	1		
"	80-1209-453	S68E222 CS 10-20 cm	1		
"	80-1209-537	Midden West of Levee Transect	1		
"	80-1209-545	E Muck Ditch S of Unit 12 to N Wall BT 1	1		
"	80-1209-680	Levee Transect Unit 0 midden	1		
"	80-1209-1215	Levee Transect Unit 10 fill	1		
"	80-1209-1385	Post Mold 71 Feature 18	1		
Bassett	80-1209-1261	Burial 14	1		
Projectile Point - Gary	80-1209-127	S48.77E157 General Excavation	1		
Perfo tor	80-1209-129	S48.77E157 General Excavation	1		
"	80-1209-436	Feature 1 West Muck Ditch S end levee fill	1		
"	80-1209-532	Midden between levee & waterscreen trench	1		
"	80-1209-548	Levee Transect Unit 3 fill	1		
"	80-1209-677	Levee Transect Unit 1 midden	1		
"	80-1209-1454	Surface	1		
Polished Cobbles	80-1108-40	Surface	2		
" "	80-1209-372	S75.5E188 midden	1		
" "	80-1209-432	Levee Transect overburden	3		
" "	80-1209-493	S83E209 CS 20-30 cm	1		
" "	80-593	Surface	1		
" "	80-1209-1001	Ext. trench S of S144E130 surface	1		
Point Midsection Fragments	80-1108-40	Surface collection	1		
"	80-1209-85	Levee Transect Unit 11 fill	1		
"	80-1209-109	Levee Transect Unit 6 fill	1		
"	80-1209-324	S41E168 CS 20-30 cm	1		
"	80-1209-433	S end of levee S of Unit 12 midden	1		
"	80-1209-532	Midden between levee & waterscreen trench	1		
"	80-1209-668	Levee Transect Unit 4 fill	1		
"	80-1209-674	Levee Transect Unit 1 fill	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Biface Proximal Fragment	80-593	Surface	2		
" " "	80-622-1	Surface	1		
" " "	80-1108-40	Surface collection	1		
" " "	80-1209-58	S72 E212 midden	1		
" " "	80-1209-63	Ext. of BT 2 E end S54.92E179.45	1		
" " "	80-1209-69	S54 E184 midden	1		
" " "	80-1209-110	Levee Transect Unit 9 fill	1		
" " "	80-1209-120	Levee Transect Unit 2 fill	1		
" " "	80-1209-299	S48.5 E191 General Excavation	1		
" " "	80-1209-432	Levee Transect from overburden	1		
" " "	80-1209-439	Levee Transect Unit 7 fill	1		
" " "	80-1209-550	Levee Transect Unit 3 midden	4		
" " "	80-1209-677	Levee Transect Unit 1 midden	1		
" " "	80-1209-943	East of Levee Transect General	1		
" " "	80-1209-1090	General surface & backdirt	1		
Biface Midsection Fragment	80-593	Surface	1		
"	80-1108-40	Surface	1		
"	80-1209-62	Ext. of BT 2 at E end S54.92E179.45	1		
"	80-1209-64	S57 E184 General Excavation	1		
"	80-1209-69	S54 E184 midden	1		
"	80-1209-70	S54 E184 midden	1		
"	80-1209-85	Levee Transect Unit 11 fill	1		
Biface Distal Fragment	80-1108-4-4	Test Unit 1	2		
"	80-1108-24-2	Test Unit 6 surface	1		
"	80-1209-1	Whole site surface	1		
"	80-1209-64	S57E184 General Excavation profile trenches	1		
"	80-1209-69	S54E184 midden	1		
"	80-1209-122	Levee Transect Unit 2 fill	1		
"	80-1209-141	Levee Transect Unit 2 midden	2		
"	80-1209-548	Levee Transect Unit 3 fill	1		
"	80-1209-674	Levee Transect Unit 1 fill	1		
"	80-1209-677	Levee Transect Unit 1 midden	1		
"	80-1209-680	Levee Transect Unit 0 midden	1		
"	80-1209-1483	General surface	1		
Biface Segments	80-1108-1-1	Surface collection	1		
" "	80-1108-29	N448 W494 Test Unit 1 level 1	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Biface Segments	80-1108-40	Surface Collection	2		
" "	80-1209-63	Ext. of BT 2 E end S54.92E179.45	2		
" "	80-1209-110	Levee Transect Unit 9 fill	1		
" "	80-1209-141	Levee Transect Unit 2 midden	1		
" "	80-1209-182	S75E179 CS 40-50 cm	1		
" "	80-1209-215	Levee Transect Unit 10 fill	1		
" "	80-1209-229	E179 S68 CS 10-20 cm	1		
" "	80-1209-276	S80 E175 CS 10-20 cm	1		
" "	80-1209-593	Levee Transect Unit 6 midden	1		
" "	80-1209-674	Levee Transect Unit 1 fill	1		
" "	80-1209-677	Levee Transect Unit 1 midden	1		
Hammerstone	80-1209-17	Shovel scraped trench between S48-57 E181	1		
"	80-1209-58	S72 E212 midden	1		
"	80-1209-127	S48.77 E157 General excavation	2		
"	80-1209-148	Levee Transect Unit 2 midden	2		
"	80-1209-217	W. Ext. of Unit 12 fill	1		
"	80-1209-253	S74 E184 CS 30-40 cm	1		
"	80-1209-255	S73 E184 CS 20-30 cm	1		
"	80-1209-257	S69 E184 CS 20-30 cm	1		
"	80-1209-320	Levee Transect Unit 10 midden	1		
"	80-1209-341	East of BT 2 S54.92 E179.45	1		
"	80-1209-431	Cleaning operations S of levee	1		
"	80-1209-431	Levee Transect overburden	2		
"	80-1209-550	Levee Transect Unit 3 midden	1		
"	80-1209-545	E Muck Ditch S of Unit 12 to N Wall BT 1	1		
"	80-1209-553	E185 S72.5 midden	1		
"	80-1209-674	Levee Transect Unit 1 fill	2		
"	80-1209-680	Levee Transect Unit 0 midden	1		
"	80-1209-687	BT 2 midden W of Conner Grave	1		
Ground Slab	80-1108-40-4	Surface	3		
" "	80-1209-922	S138 E136 midden	1		
" "	80-1209-1327	Caddo III/IV compor [illegible]			
Tabular Piece or Ground Stone	80-1209-34	S42 E181 midden	1		
" "	80-1209-38	General area around S[illegible] E212 midden	1		
" "	80-1209-202	E154 S64 CS 50-60 cm	1		

10 continued. Lithic Tools from 3LA97 by Artifact Class.

Artifact Type	Catalog Number	Provenience	Size	Weight	Totals
Tabular Piece or Groundstone	80-1209-532	Midden between levee waterscreen trench	3		
" "	80-1209-537	Midden west of levee transect	3		
" "	80-1209-539	West Muck Ditch S of Unit 12	1		
Abrader	80-1108-40	Surface	1		
"	80-1209-922	Burial 7	1		
"	80-1209-1300	Inside house S of road	1		
Anvilstone	80-1209-536	Historic roadbed 0 east of E Muck Ditch Unit 8	1		
"	80-1209-1327	Caddo IV component	1		
Celts - Diorite frag.	80-1108-40-9	Surface collection	1		
Petaloid	80-1209-120	Levee Transect Unit 2 fill	1		
Diorite frag.	80-1209-328	S63 E179 CS 50-60 cm	1		
" "	80-1209-446	Feature 1 W Muck Ditch W of LT Units 7&8	1		
Petaloid, diorite	80-1209-532	Midden between levee & waterscreen trench	1		
Dior te frag.	80-1209-548	Levee Transect Unit 3 fill	1		
" "	80-1209-553	E185 S72.5 midden	1		
Petaloid, diorite	80-1209-591	Levee Transect Unit 5 midden	1		
Petaloid, chert cobble	80-1209-748	xt. Unit W of Levee Transect Unit 6 W of BT 7	1		
" "	80-1209-965	Post Mold 18	1		
Ground Hematite	80-1209-433	S end of levee S of Unit 12 midden	1		
" "	80-1209-1328	Caddo III/IV component	1		
Distal Point Fragments	80-1209-58	S72 E212 midden	1		
" " "	80-1209-129	S48.77 E157 General Excavation	1		
" " "	80-1209-447	Levee Transect Unit 7 midden	1		
" " "	80-1209-550	Levee Transect Unit 3 midden	1		
" " "	80-1209-668	Levee Transect Unit 4 fill	1		

TU = Test Unit
LTU = Levee Transect Unit
CS = Column Sample
HB = Historic Burial
B = Aboriginal Burial
PM = Post Mold
F = Feature
BT = Backhoe Trench

APPENDIX XI
EXAMPLES OF AAS FORMS

Arkansas Archeological Survey — EXCAVATION UNIT SUMMARY

Site No. ____________ Recorder ____________ Date ____________

Unit ____________ Excavator(s) ____________

Size ______ x ______ Feature(s):Recorded ____________ Excavated ______

Depth ____________ Burial(s):Recorded ____________ Excavated ______

Levels ____________ Floor Plan(s) Drawn ____________

Vertical Profile(s) Drawn ____________

Summary of Objects Observed and/or Collected: Give number of boxes and/or bags.

Artifacts ____________

C-14 samples ____________ Archeomagnetic samples ____________

Soil, Pollen, and/or Flotation samples ____________

Excavation Strategy and Techniques: Give screen size(s).

____

Field Conditions and Additional Notes: stratigraphy, associations, disturbances.

____

Inference and Interpretation:

____

Form created 10/21/79 to supplement Excavation Unit Level Sheet and Feature Description Form. Adapted from form by SUNY Buffalo Archaeological Survey.

STYLE KEY FOR EXCAVATION ILLUSTRATIONS

Use the following standardized designations when drawing on graph paper:

Well defined boundary	———	Ground surface	
Hypothetical or indistinct boundary	— — —	Plowzone and/or humus	
Unmodified rock		Gravel	
Bedrock		Sand	
Fire-cracked rock		Silt (no texture)	
Charcoal	C or	Clay	
Bone fragment	X or outline	Fire-reddened soil	
Feature (give number)	F_ or Fea_	Darkly-stained soil	
Burrow (show limit)		Disturbance (show limit)	
Postmold (give diameter) definite ● possible ○		Artifact (Draw outline or show symbol. Give Field #)	▲

Notes:

Floor or level plan: Show north arrow. Label all corners. Label stake or pin in southwest corner as unit datum. Identify the level, zone, or stratum which is shown. Give the depth below the surface from the unit's datum at each of the four corners and in the center of the unit. When appropriate show cross-section lines and label their ends.

Profiles: Indicate which wall (of a test unit) or face (of a cross-sectioned feature) that is illustrated (east, west, north, south). Label the stake or pin corners at the surface of a wall profile. Show the datum plane or level line from which measurements were made.

All: Give the scale using a bar scale. Use Munsell soil charts to determine colors; give both the alphanumerical designation and the English description (for example: 10YR 3/3, dark brown). Use a sharp 2H pencil (never ink). Label everything and be accurate!!

Bar scales: one m — one m

Field Site No. ____________

State Site No. ____________

ARKANSAS ARCHEOLOGICAL SURVEY
FIELD SPECIMEN CATALOG

SHEET NO. ________ OF ________

ACCESSION NO. ____________ PROJECT NAME ____________ # ____________ PROJECT SUPERVISOR ____________

FSN Number	Feature or Area	Horizontal Location and/or Grid Square Number	Vertical Location or Stratum	Specimen Description and Remarks	No. Bags	Date Collected	Col-lec-tor	Lab

11/25/81

COLLECTION PROCESSING INVENTORY

Project ____________ Recorder ____________

Site ____________ Date ____________

Field Serial #	Not Screened	Screen Size Water	Screen Size Float	Wheelbarrow Loads	Bucket or Bag Loads	Total Loads	Total Envelopes, Bags and/or Boxes	Comments

Project

ARKANSAS ARCHEOLOGICAL SURVEY: DAILY WORK REPORT

Date

TYPE OF WORK* ______________________ SUPERVISOR: ______________________ Weather Conditions: Wet ____ Dry ____ Hot ____ Cold ____

Section or Area Surveyed	Site(s) Names and Nos.	Tests or Excavation Units	Size	Levels or Depth	Collections Made	Crew Member(s)

*Background Research, Permissions, Reconnaissance, Excavations, Laboratory Analysis, Report Preparation

(Adopted from SUNY Buffalo Archeological Survey form: October 15, 1978)

80- ____ - [ ] FSN Date: [ ] Month Day [ ] Year Site #: [ ]

Provenience:

Sorted by ______________________ Time ____ - ____ hrs

	Ct.	Wt.	Ct.	Ct.	Wt.	Wt.	Wt.	Wt.	Ct.	Ct.	Wt.	Ct.	Ct.				
S1																	Comments on back
S2																	
S3																	
S4																	
Class of Material (LSN)	Aborig. Ceramics ( )	Daub ( )	Chipped Stone ( )	Ground/Polish Stone ( )	Flks/Shatter Blk.Frg. ( )	Lithics Misc. ( )	Floral ( )	Animal Products ( )	Glass ( )	Euramerican Ceramics ( )	Brick ( )	Metal ( )	Synthetic ( )				
Unscreened																	
Total																	

ARKANSAS ARCHEOLOGICAL SURVEY
FIELD PHOTO RECORD

PROJECT ____________________ ROLL NO. ________

SITE NO(S). ____________________ CAMERA FILM SIZE AND TYPE ________

PHOTOGRAPHER ____________________

EXP. NO.	DATE	DIREC-TION	DESCRIPTION	NEGATIVE NUMBER

Date negatives submitted for processing: ________

Date prints and Negative Nos. received: ________

Date photo ID forms sent for Photo Files: ________

Date slide ID forms sent for Files & Neg. Nos.: ________

Date slide ID forms received with Neg. Nos.: ________

Arkansas Archeological Survey

FEATURE RECORD

Site No. ________

Accession No. ________

Sheet No. ________

Fea. #	Description	Field Serial Number	Section	Stratum	Recorder	Date

Modified 10/20/80

ARKANSAS ARCHEOLOGICAL SURVEY
FEATURE RECORD

SITE NO. ________
FEATURE NO. ________

FEATURE ____

PROJECT ______________________ RECORDER ______________

EXCAVATOR(S) ______________________ DATE(S) ______________

HORIZONTAL LOCATION ____________________________________

VERTICAL LOCATION (assoc. strata; top and bottom depths) ____________

DESCRIPTION ____

MATERIALS COLLECTION IN ASSOCIATION WITH FEATURE: ACCESS. NO. ________

FSN	Specimen	FSN	Specimen	FSN	Specimen

EXPLANATION OF C14, SOIL, OR POLLEN SAMPLES ____________________

ASSOCIATED FEATURES ____________________________________

PHOTOGRAPHS ____

ADDITIONAL REMARKS ______________________________________

(plan and cross section scale drawings on separate page of graph paper.)

modified 10/21/80

ARKANSAS ARCHEOLOGICAL SURVEY

Excavation Unit Level Sheet

Unit No. ________ Site No. ________

Project ________ Area ________ Date ________

Level ________ Excavator(s) ________

Below: Plan view at:

Recorder ________

(this edge is north)

ARKANSAS ARCHEOLOGICAL SURVEY
RADIOCARBON SAMPLE DATA RECORD

RECORDER ____________ SITE NAME ____________ SITE NO. ______

LATITUDE/LONGITUDE COORDINATES ____________

SITE DESCRIPTION AND GEOGRAPHIC LOCATION ____________

____

COMPOSITION OF SAMPLE ____________

SAMPLE ON DEPOSIT AT ____________ CAT.-NO. ______

COLLECTING TECHNIQUE ____________

____________ DATE OF COLL. ______ COLLECTOR ______

CONTAMINATION FACTORS ____________

HORIZONTAL LOCATION OF SAMPLE ____________

VERTICAL LOCATION OF SAMPLE ____________

ASSOC. MATERIALS OR FEATURES ____________

____

CULTURAL AFFILIATION OF SITE OR COMPONENT ____________

ESTIMATED DATE OF SAMPLE BASED ON ARTIFACT ANALYSIS ____________

IMPORTANCE OF ASSAYING SAMPLE ____________

____

____

RELEVANT PUBLICATIONS ____________

- - - - - - - - - - - - - - - - - - - -

SAMPLE SUBMITTED FOR ASSAY TO ____________

SUBMITTED BY ____________ DATE OF SUBMISSION ______

LABORATORY TREATMENT OF SAMPLE ____________

____

LABORATORY NO. OF SAMPLE ____________ C14 AGE ______

INTERPRETATION OF AGE OF SAMPLE ____________

____

____

____

____

ASSOCIATED DOCUMENTS ____________

ARKANSAS ARCHEOLOGICAL SURVEY — SHOVEL TEST RECORD

Project ____________ Supervisor ______

Section ____________ Crew Member ______

Date ______ Shovel Test Interval ______ Page ____ of ____

Test No.	Soil Zone No.	Depth below Surface at top	Depth below Surface at bottom	Soil Code	Description: Note soil colors evidence of disturbance, cultural zones, cultural material, etc. Note testing problems	Data or Profile References

Soil Codes: PZ=plowzone; HU=humus; SI=silt, GR=gravel, SA=sand; CL=clay; LO=loess, OT=other (describe)

(Adapted from SUNY Buffalo Archeological Survey form: October 15, 1977)

Arkansas Archeological Survey

FEATURE RECORD

Site No. ____________

Accession No. ________

Sheet No. ___________

Fea. #	Description	Field Serial Number	Section	Stratum	Recorder	Date

11/25/81

ARKANSAS ARCHEOLOGICAL SURVEY
FIELD PHOTO RECORD

PROJECT NAME ______________________ NO. ____________ ROLL NO. ____________

SITE NO(S) ______________________ CAMERA FILM SIZE AND TYPE ____________

PHOTOGRAPHER ______________________

EXP. NO.	DATE	DIREC-TION	DESCRIPTION	NEGATIVE NUMBER

Date negatives submitted for processing: ____________

Date prints and Negative Nos. received ____________

Date photo ID forms sent for Photo Files: ____________

Date slide ID forms sent for Files & Neg Nos.: ____________

Date slide ID forms received with Neg. Nos.: ____________

Skeletal Record/Page 3

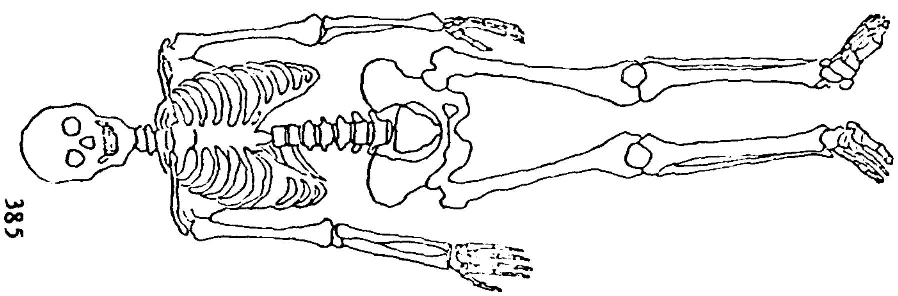
Site # ______ Skeletal Catalog # ____

BURIAL INVENTORY:
TEETH: Number refer to adult dentition, letters to deciduous dentition of children
KEY: Symbols to be used in Tooth Inventory

8 = tooth present
8 = tooth present; socket missing
8 = socket present; tooth missing
8 - tooth erupting
8 = tooth not visible, may be in bone
8 = tooth destroyed by excavator

				e	d	c	b	a	a	b	c	d	e			
Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
				e	d	c	b	a	a	b	c	d	e			

BONE: Key: Symbols to be used in bone inventory
nothing - no bone present bone present



Left		Right	Left		Right	Left		Right
	Occipital			Zygomatic			Phalanges (fingers)	
	Parietal			Palatine			Illium	
	Frontal			Maxilla			Ischium	
	Temporal			Mandible			Pubis	
	Sphenoid			Clavicle			Femur	
	Ethmoid			Scapula			Patella	
	Ossicles			Humerus			Tibia	
	Nasal			Ulna			Fibula	
	Vomer			Radius			Tarsals	
	Inf Nasal Concha			Carpals			Metatarsals	
	Lacrimal			Metacarpals			Phalanges (toes)	

Bundle Burials

Skeletal Record/Page 4

BONE INVENTORY: Key: Circle the number present

Vertebrae:

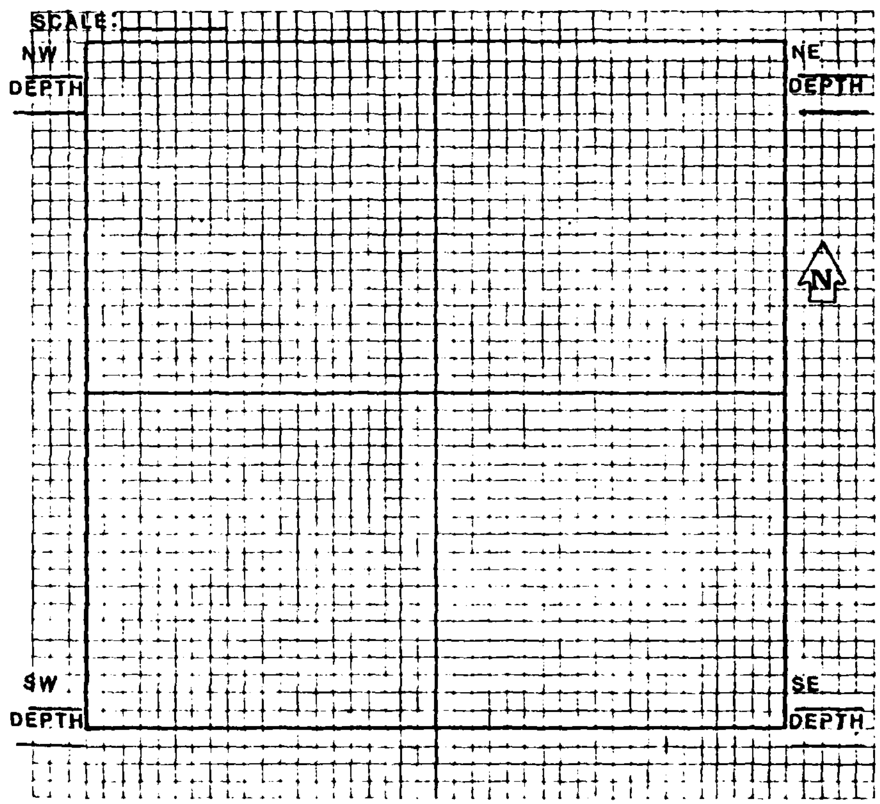
Cervical:	1 2 3 4 5 6 7
Thoracic:	1 2 3 4 5 6 7 8 9 10 11 12 13 14
Lumbar:	1 2 3 4 5
Sacrum:	1 2 3 4 5
Coccyx:	1 2 3 4 5

Sternum: Manubrium 1 Mesosternum 2 3 4 5 Xiphisternum 6

Right Ribs: 1 2 3 4 5 6 7 8 9 10 11 12

Left Ribs: 1 2 3 4 5 6 7 8 9 10 11 12

SCALE: ______________ Do a rough sketch of this burial for the osteologist even if you are doing formal drawing on other paper.



ARKANSAS ARCHEOLOGICAL SURVEY
SKELETAL RECORD

SITE NAME: ____________ Field Site No. ______ State Site Number ______

PROJECT NAME ____________ FEATURE NO.: ______

RECORDED BY: ____________ SKELETAL FSN NO.: ______

Excavation Unit(s): ____________

Horizontal Location in Feature: ____________

Vertical Location in Feature: ____________

BURIAL TYPE:		BURIAL DIRECTION:	N	NE	E	SE	S	SW	W	NW
primary	____	trunk								
secondary	____	skull								
bundle	____	face								
cremation	____	R. arm								
multiple	____	L. arm								
single	____	R. leg								
partial	____	L. leg								
skull	____	BURIAL CONDITION:								
pile	____	preservation ____								
other	____	SEX:								
BURIAL POSITION:		criteria								
extended	____	pelvis ____								
fully flexed	____	robusity ____								
semiflexed	____	skull ____								
supine	____	identified by: ____								
prone	____	AGE:								
L. side	____	teeth ____								
R. side	____	pubis ____								
other	____	epiphyseal ____								
		general ____								

NUMBER OF PACKAGES OF BONE: ____________ NO. OF BOXES: ____________

BURIAL PACKING LIST: list each box of bone packed, and the contents of each box.
Example: Box 1: 737-1, 737-2, etc.; or Box 1: Bags 1, 2, 3, 4, etc.; or Box 1: skull, 1. radius, etc.

1/12/83

Field Sit...

Comments

Unit ID Elevation of Excavation
unit datum

COORDINATES

Depth

Page 2

	Assoc.
FSN is part of FSN	
FSN contains FSN	
FSN is same as FSN	
FSN is above, but not intrusive to, FSN	
FSN is below, but not intruded by, FSN	
FSN is adjacent to FSN	
FSN superimposes FSN	
FSN is superimposed by FSN	
FSN intersects FSN	
FSN is within Ex unit FSN	

Soil Matrix

Matrix color (Munsell)

Matrix texture (e.g. loam)

Field Time and Effort

Total number of person-hours spend excavating this unit ____ hrs

Total number of person-hours spent recording this unit ____ hrs

Supervisor ____

Recorder ____

Beginning day (year/month/day) (/)

Ending day (year/month/day) (/)

Recovery Information

Percent of FSN excavated ____ Percent of deposit screened ____ %

Screen ____
size

Volume of deposit floated ____ liters

If feature,
give total volume excavated ____ liters

Field Sample Inventory		
Water screen loads		
Flotation samples		
Faunal		
Floral		
Human bone		
Other		

Comments

AAS 1...

APPENDIX XII
EXAMPLES OF BIOARCHEOLOGICAL FORMS

CRANIAL INVENTORY

Burial No: ____________ Site: ____________
Catalogue No: ____________ Recorder: ____________

	Age	Sex	Path.	R	L	M	I	%Complete
1. Frontal								
A. Brow Ridge								
B. Vault								
2. Parietal								
3. Occipital								
A. Basilar								
B. Lateral								
C. Squamousal								
4. Temporal								
A. Petrous								
B. Mastoid								
C. Squamousal								
5. Zygomatic								
6. Sphenoid								
7. Maxilla								
A. Alveolar								
B. Facial								
8. Nasal								
9. Ethmoid								
10. Lacrimal								
11. Vomer								
12. Palate								
13. Ear								
A. Malleus								
B. Incus								
C. Stapes								
14. Mandible								
A. Chin or body								
B. Ramus								

PATHOLOGIES NOTED: ____________

CRANIAL MEASUREMENTS

Maximum carnial length	______	Orbital height	______
Maximum cranial breadth	______	Orbital breadth	______
Porion-bregma height	______	Palatal length	______
Minimum frontal breadth	______	Palatal breadth	______
Upper facial height	______	Bigonial breadth	______
Bizygomatic breadth	______	Height of ascending ramus	______
Nasal height	______	Height of mandibular symphysis	______
Nasal breadth	______	Gonial Angle	______
		Mandibular length	______

POSTCRANIAL INVENTORY

Burial No. ____________ Site ____________
Catalogue No. ____________ Recorder ____________ Date ____________

RIGHT	CONDITION	LEFT
______ M1-2-3L	Clavicle M1-2-3L	______
______ A-M/I	Scapula A-M/I	______
______	Atlas/Axis	______
______	Cervical 3-7	______
______	Thoracic 1-12	______
______		______
______	Lumbar 1 5	______
______		______
______	Ribs	______
______ P1-2-3-4D	Humerus P1-2-3-4D	______
______		______
______ P1-2-3-4D	Radius P1-2-3-4D	______
______		______
______ P1-2-3-4D	Ulna P1-2-3-4D	______
______		______
______	Carpals	______
______	Metacarpals	______
______	Phalanges	______
______ A S/P	Ilium A S/P	______
______ S-F/I	Pubis S-F/I	______
______	Ischium	______
______	Sacrum 1-2-3-4-5	______
______ P1-2-3-4D	Femur P1-2-3-4D	______
______		______
______	Patella	______
______ P1-2-3-4D	Tibia P1-2-3-4D	______
______		______
______ P1-2-3-4D	Fibula P1-2-3-4D	______
______		______
______	Calcaneus	______
______	Talus	______
______	Tarsals	______
______	Metatarsals	______
______	Phalanges	______

BURIAL ANALYSIS

Burial No. ____________ Site ____________
Catalogue No. ____________ Recorder ____________
Sex ____________ Age ____________

Sex Classification

	Score	Weight	Class
I. SIZE AND ROBUSTICITY			
1. Supraorbital torus	____	1	____
2. Zygomatic arch	____	1	____
3. Overall observation	____	1	____
4. Clavicle Length & robusticity	____	1	____
L. ____ R. ____			
5. Minimum Diam. Humerus Head	____	2	____
L. ____ R. ____			
6. Maximum Diam. Femur Head	____	2	____
L. ____ R. ____			
7. Circumference Femur Midshaft	____	2	____
Total		____	____
Score		____	
II. MUSCLE ATTACHMENTS			
8. Mastoid process	____	2	____
9. Ext. occipital protuberance	____	1	____
10. Gonial region	____	1	____
11. Linea aspera	____	2	____
12. Overall observation	____	1	____
Total		____	____
Score		____	
III. SHAPE			
13. Eye orbit	____	1	____
14. Chin	____	1	____
15. Cranium	____	1	____
16. Femoral angles	____	1	____
Total		____	____
Score		____	
IV. PELVIS			
17. Pubic angle	____	2	____
Ischium pubic index	____		
18. Obturator foramen	____	1	____
19. Sciatic notch	____	2	____
20. Pubis (Phenice)	____	2	____
21. Sacrum	____	1	____
22. Pelvic basin	____	1	____
23. Acetabulum	____	1	____
24. Sacro-iliac region	____	1	____
Total		____	____
Score		____	

Sexuality Score	Total Class	Total Weight
I	____	____
II	____	____
III	____	____
IV	____	____
	____	Divided by ____
	Sexuality Score	____

AGE CLASSIFICATION

Union of Centers of Ossification

	Krogman	[illegible]	
Scapula			
Acromion process	[illegible]	17-22	____
Vertebral margin	[illegible]	17-22	____
Inferior angle	[illegible]	17-22	____
Clavicle			
Sternal end	25.0-28.0	18-30	____
Acromial end	19.0-20.0	——	____
Humerus			
Head	19.5-20.6	16-23	____
Distal (trochlea)	14.0-15.0	10-19	____
Medial epicondyle	15.0-16.0	10-19	____
Radius			
Head	14.6-15.6	13-19	____
Distal end	18.0-19.0	15-23	____
Ulna			
Olecranon process	14.6-15.6	13-19	____
Distal end	18.0-19.0	15-23	____
Hand			
Metacarpals	15.6-16.6	——	____
Phalanges I and II	15.0-16.0	14-21	____
Phalanges III	14.6-15.6	14-21	____
Pelvis			
Primary elements	13.0-15.0	13-16	____
Iliac crest	18.0-19.0	16-23	____
Ischial tuberosity	19.0-20.0	17-25	____
Femur			
Head	17.0-18.0	15-20	____
Greater trochanter	17.0-18.0	15-20	____
Lesser trochanter	17.0-18.0	15-20	____
Distal end	17.6-18.6	16-22	____
Tibia			
Proximal end	17.6-18.6	16-22	____
Distal end	15.6-16.6	16-20	____
Fibula			
Proximal end	17.6-18.6	16-22	____
Distal end	15.6-16.6	16-20	____
Calcaneal epiphysis	14.6-15.6	12-22	____
Foot			
Metatarsals	15.0-16.0	12-22	____
Phalanges I	14.6-15.6	12-22	____
Phalanges II	14.0-15.0	12-22	____
Phalanges III	14.0-15.0	12-22	____

Vertebrae		Fusion of Arch		Fusion of Arch to Body		Fusion of Epiphyseal Rings and Centrum
Cervical	(1-3)	____	(3-6)	____	(17-25)	____
Thoracic	(1-3)	____	(3-6)	____	(17-25)	____
Lumbar	(1-3)	____	(3-6)	____	(17-25)	____
Basilar Suture Krogman (18-25)						____

Dental development ____________
Dental attrition ____________
Cranial sutures ____________
Pubic Symphysis
Todd phase ____________ age ____________
McKern-Stewart-Gilbert score ____________ age ____________
Sacro-iliac surface (Lovejoy) phase ____________ age ____________
Other

SKELETAL MEASUREMENTS

BURIAL NO. ____________ RECORDER ____________

CATALOGUE NO. ____________ DATE ____________

Cranium

1. Max. length ______
2. Max. breadth ______
3. Max. height ______
4. Porion-Bregma ht. ______
5. Min. frontal brd. ______
6. Upper facial ht. ______
7. Bizygomatic brd. ______
8. Orbital ht. ______
9. Orbital brd. ______
10. Maxillo-alveolar lth ______
11. Maxillo-alveolar brd ______
12. Bicondylar brd. ______
13. Mandibular lth. ______
14. Ascending ramus ht. ______
15. Symphyseal ht. ______

Scapula

16. Max. length ______
17. Max. breadth ______

Clavicle

18. Max. length ______
19. Circum. Midshaft ______

Humerus

20. Max. Length ______
21. Min. Diam. head ______
22. Circum. Midshaft ______

Radius

23. Max. length ______

Ulna

24. Max. length ______
25. Phys. length ______

Sacrum

26. Max. ant. ht. ______
27. Max. ant. brd. ______

Innominate

28. Max. height ______
29. Max. breadth ______
30. Ischial lth. ______
31. Pubis lth. ______

Femur

32. Max. lth. ______
33. Phys. lth. ______
34. Max. diam. head ______
35. Circum. midshaft ______
36. Subtro. A-P diam. ______
37. Subtro. M-L diam. ______

Tibia

38. Max. lth. ______
39. A-P diam. ______
40. M-L diam. ______

Fibula

41. Max. length ______

CRANIAL NON-METRIC VARIANTS
(after Buikstra)

Site: ____________ Burial No. ____________ Cat. No. ____________

Recorder: ____________ Date: ____________

Trait	Right	Left	Medial
Epipteric Bone	____	____	
Asterionic Bone	____	____	
Parietal Notch Bone	____	____	
Os Lambdoid Suture	____	____	
Os Coronal Suture	____	____	
Os Japonium	____	____	
Infra-orbital Suture	____	____	
Parietal Notch	____	____	
Supra-orbital Notch	____	____	
Supra-orbital foramina	____	____	
Accessory Supra-orbital foramina	____	____	
Multiple Mental Foramina	____	____	
Mylo-hyoid Arch	____	____	
Accessory Infra-orbital foramina	____	____	
Tympanic Dihiscence	____	____	
Auditory Exostoses	____	____	
Divided Hypoglossal Canal	____	____	
Post-Condylar Canal not Patent	____	____	
Foramen Ovale incomplete	____	____	
Foramen spinosum open to F. lacerum	____	____	
Multiple Zygomatico-facial foramina	____	____	
Pterygo-alar spurs	____	____	
Pterygo-spinous spurs	____	____	

CRANIAL NON-METRIC VARIANTS (Page 2)

Site: ____________ Burial No.__________ Cat. No. ________

Trait	Right	Left	Medial
Metopic Suture open			___
Bregmatic Bone			___
Inca Bone			___
Apical Bone			___
Os sagittal Suture			___
Superior Sagittal Sulcus turns right			___
Mandibular Torus	___	___	
Palatine Torus			___
Obelionic foramina	___	___	

POST-CRANIAL NON-METRIC VARIANTS

Trait	Right	Left
Atlas: Lateral Bridging	___	___
Atlas: Posterior Bridging	___	___
C3: Accessory Foramina	___	___
C4: Accessory Foramina	___	___
C5: Accessory Foramina	___	___
C6: Accessory Foramina	___	___
C7: Accessory Foramina	___	___
Humerus: Septal Aperture	___	___
L5: Spondylysis	___	___

MANDIBULAR DENTAL MORPHOLOGY (after Turner and Swindler 1978)

		RIGHT										LEFT				
		M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3
Lower incisor shoveling								☐	☐	☐	☐						
Canine distal accessory ridge							☐					☐					
Premolar lingual cusps					☐	☐							☐	☐			
Molar grove pattern		☐	☐	☐											☐	☐	☐
Molar cusp number		☐	☐	☐											☐	☐	☐
Protostylid		☐	☐	☐											☐	☐	☐
Cusp 6		☐	☐	☐											☐	☐	☐
Cusp 7		☐	☐	☐											☐	☐	☐
Deflecting wrinkle		☐	☐	☐											☐	☐	☐
Third molar		☐															☐
Torus	☐																

NOTES: ____

____

____

____

MAXILLARY DENTAL MORPHOLOGY (after Turner and Swindler 1978)

		Right										Left				
		M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3
Winging									☐	☐							
Shoveling							☐	☐	☐	☐	☐	☐					
Double shovel (labial)							☐	☐	☐	☐	☐	☐					
Tuberculum dentale							☐	☐	☐	☐	☐	☐					
Incisor interruption grooves								☐	☐	☐	☐						
Canine distal accessory ridge							☐					☐					
Bushman canine							☐					☐					
Premolar cusp number					☐	☐							☐	☐			
Cusp 5		☐	☐	☐											☐	☐	☐
Carabelli's cusp		☐	☐	☐											☐	☐	☐
Hypocone		☐	☐	☐											☐	☐	☐
Third molar		☐															☐
Torus	☐																

NOTES: ____

____

____

____

APPENDIX XVI
ABSTRACT OF HISTORIC CEMETERY REPORT

Excavations carried out in 1982 (by the Arkansas Archeological Survey under contract with the New Orleans District of the U.S. Army Corps of Engineers) at the Cedar Grove site (3LA97) in Lafayette County, Arkansas, recovered and relocated 80 graves from a historic Black cemetery threatened by erosion and revetment construction along the south bank of the Red River. Each grave was excavated and the artifactual and skeletal data were recorded in temporary field laboratories prior to the relocation of all remains to a new cemetery. Analysis of the artifactual material dated all graves to the period 1890 to 1927 when the cemetery was covered by silt from a major flood of the Red River. Preliminary analysis of the casket hardware and personal grave goods suggests differential mortuary treatment by age and possibly economic resources. Analysis of the skeletal demographics showed that the reconstructed age and sex profile represents a highly stressed but normal biological population. Preliminary analysis of the skeletal data indicates high frequencies of anemia, rickets, scurvy, and protein malnutrition. The presence of weanling diarrhea is indicated by high frequencies of systemic periostitis, active cribra orbitalia, and a modal childhood age at death of 18 months. High frequencies of degenerative joint disease on the adult skeletons suggests a hard, rigorous life style which indicates that the amount of physical labor required of Blacks had not changed since slavery. The high incidence of interpersonal violence is probably associated with the turmoil created by the beginning of segregation in Arkansas. Comparison of these data to the historical record reveals that diet, health, and general quality of life for southwest Arkansas Blacks had deteriotated significantly since emancipation due to the fall in cotton prices and legalized discrimination.

A REVIEW OF THE INVESTIGATIONS AT CEDAR GROVE

Jeffrey P. Brain
Peabody Museum

Dr. Jeffrey P. Brain contributed a peer review based upon his reading of a two volume draft report submitted to the New Orleans District of the U.S. Army Corps of Engineers in March 1983. He suggested a number of editorial changes be made prior to publication of the manuscript. In light of the publication schedule Dr. Brain was unable to respond with a revised peer review to this final manuscript, however, what follows are excerpts of his original review:

> "Despite the fact that the excavation was basically a salvage operation, and was limited by severe temporal constraints, it was obviously well-organized and conducted under the highest professional standards--in keeping with the fine record of the AAS (this is not a hollow platitude, but recognition of a well-earned reputation). In addition to the usual field techniques, conditions warranted the use of heavy earthmoving equipment, as well as metal detectors and that infamous Arkansas tool, the probe. All were seemingly used to good advantage, and it is probable that a maximum amount of information was extracted within the time available. In fact, it is amazing that so much was gained when it is realized that they had to work between the graves of the extensive historic cemetery. . . . The extent of the cemetery was the big surprise, and one must wonder whether the major commitment detailed in this report would have been made if the amount of disturbance had been realized beforehand. Happily, the crystal ball was not available.
>
> "In order to achieve this broader (interdisciplinary) objective, the participation of specialists in a number of fields . . . was solicited. In most cases, the participation consisted of analyses of data conducted after the excavations had been completed. The lack of interdisciplinary input prior to excavation, and as a guide thereto, is a weakness that must be overlooked due to the exigencies of the situation.
>
> "To summarize, I am very impressed that so much could be made of so little. Although Cedar Grove is a relatively unimportant and badly disturbed site, the opportunity was taken to derive as much information from it as the situation allowed. . . . There is the uneasy suspicion that some of the analyses were conducted simply because they contribute to the claim of an interdisciplinary approach, but they generally are excellent in their description of methodological procedures and potential application to archeological problems. Unfortunately, while significant in these respects, the results in many cases were not very significant for the stated goals of the project. We still do not know all that much about the site and who lived there, except that it was a small, year-round late Caddo IV - early Caddo V occupation. We have learned practically nothing about the effects of European contact. The primary problem was the damaged condition of Cedar Grove, not the archeological effort. It is, again, a remarkable feat that so much was retrieved when so much had been destroyed."

The present form of this manuscript is due, in part, to Dr. Brain's excellent suggestions, and we would like to extend our sincerest appreciation to him for his time and effort.

W. Fredrick Limp
Program Coordinator

A REVIEW OF THE INVESTIGATIONS AT CEDAR GROVE

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The U.S. Army Corps of Engineers, along with the other federal agencies having cultural resource management responsibility, often face difficult decisions in regard to site mitigation. Establishing whether or not a threatened archeological site should be excavated (and if so, to what extent) is in many cases neither simple nor straightforward. If, on the one hand, initial testing shows a site to be a small plowzone lithic scatter devoid of diagnostics, the mitigation decision is not all that agonizing. Similarly, if initial testing exposes a long sequence of sealed short term occupational episodes replete with activity areas, structures, burials, etc. spanning the entire early and mid-Holocene, deciding whether or not to excavate is not exactly difficult. But all too often sites fall into the broad gray area between these two extremes, and it is not at all clear even after testing, that the archeological data set waiting to be recovered is worth the necessary commitment of people and funds. There is always the very real and present possibility that deciding to carry out major excavation and analysis of materials from such a "gray area" site will be shown, in hindsight, to have been an expensive if perhaps not predictable, mistake.

In light of this, I have always viewed the peer review policy of the Arkansas Archeological Survey with an equal measure of admiration and fascination. They actually pay (hopefully objective) archeologists to critically dissect a recently completed report of investigations. In addition they agree to publish each of these reviews as part of the final version of the report. Any archeologists asked to provide such a peer review is in turn ego-bound to try to find the logical lapses and the inadequacies of the data set, and to raise, if appropriate, questions concerning why and how the site was selected for excavation in the first place. Although such peer reviews cannot be expected to always provide fair and insightful assessments, the existence of the Arkansas Archeological Survey peer review system eloquently underscores the justifiable confidence they have in the quality of their research and the resultant written reports.

I am rather embarrassed to admit that if my opinion had been solicited during the initial testing phase at the Cedar Grove site, I might well have responded that the location had been so badly disturbed by historic grave digging and levee building activities that little worthwhile information could be expected to be forthcoming from the few features, postholes, and scattered prehistoric burials that had been located.

Fortunately, the New Orleans Office of the U.S. Army Corps of Engineers did not ask for my opinion at that point in the investigations of the obviously disturbed, clearly "gray area," Cedar Grove site. Instead they contracted with the Arkansas Archeological Survey to carry out more extensive excavations at the site, and subsequently agreed to fund specialized analyses of recovered plant, animal, and human remains, along with lithic, chronometric, and geomorphological studies.

The results of this research into the prehistoric occupation of the Cedar Grove site, in the form of a report edited by Neal Trubowitz, convincingly demonstrates the wisdom of the Corps's mitigation decisions. The commitment of significant funding to excavation at Cedar Grove, and the subsequent underwriting of analysis of recovered materials, I hasten to add, could have resulted minimally useful results if the Arkansas Archeological Survey had not been selected to investigate the site.

It is not at all difficult to imagine the kind of report that might have resulted from a less competent, less experienced research organization carrying out the work at such a difficult site as Cedar Grove. There are unfortunately a wide variety of limited circulation spiral bound reports around to serve as examples of what the Cedar Grove site report might have been--unfocused and unorganized--illustrating, through numerous tabulation tables of lithic, ceramic, and feature categories, a poor control of material culture and regional chronology, and a patent failure to have formulated an adequate problem orientation or research design.

To gain a fuller appreciation of what Trubowitz et al. have accomplished here, I recommend pulling a foot or so of those spiral bound reports off your lower shelf and reading through them before starting in on Cedar Grove.

In essence, what has been accomplished in this report is a detailed and well-focused problem-oriented (see Chapter 2) reconstruction of the occupation of a small, and likely rather typical, Caddo V farmstead in the Lester Bend area of the Red River. This multifaceted reconstruction is all the more impressive in that a sizable portion of the archeological record of this farmstead was subsequently displaced or obliterated by a levee (1836-1887), a cemetery (1834?-1927), and a road (nineteenth-twentieth century).

In spite of the less than pristine nature of the prehistoric component(s) at Cedar Grove (in addition to the late Caddo IV-Caddo V farmstead, an isolated, secondary midden deposit dating to early Caddo IV times was only briefly sampled), the research potential of the site was recognized as significant in light of: (1) the almost total lack of prior archeological information available concerning the Caddo V period; and (2) the realization that while other Caddo V settlements no doubt lay buried under the flood deposited silts of the Red River, they would likely come to light in the same manner as so many others had--exposed and destroyed, first by the meandering course of the Red River, and subsequently by opportunistic relic hunters.

A crucial variable in the recognition of the importance and research potential of Cedar Grove site was the expertise of Frank Schambach. Because of his detailed knowledge of the culture history of the region (see Chapter 1) and his ceramic taxonomic talents, Schambach was able to accurately place the Cedar Grove occupational episode as very late Caddo IV and Caddo V (with the exception of the small early Caddo IV midden) on the basis of a rather limited sherd collection resulting from the one week test excavations carried out in June 1980.

A variety of subsequent chronometric analyses were carried out on materials recovered during the major November-December 1980 excavations, with the following results: 14 radiocarbon samples yielded extremely imprecise temporal determinations and provided only weak support for a Caddo V temporal placement for Cedar Grove; eight archeomagnetic specimens collected from a single feature yielded such widely divergent remnant magnetic directions that they no doubt came from a redeposited fired clay context; ceramic samples from three features yielded nine thermoluminescent dates, ranging from 1520 to 1770 A.D., with sigma values of 30 to 55 years (I share Daniel Wolfman's excitement concerning the great potential of thermoluminescent dating of shell tempered sherds from late prehistoric and historic sites); finally, Frank Schambach and John Miller confirmed Schambach's previous temporal assessment through analysis of a total of 67 whole vessels recovered from 12 grave lots, along with 9,262 sherds from a nonmortuary context, concluding that the late Caddo IV-Caddo V occupation of Cedar Grove took place during a brief span of about 60 years, most probably between 1670 and 1730. This fine grain ceramic chronological assessment of the Cedar Grove occupation was crucial in two respects. First, it clearly established the historical context of Cedar Grove, allowing the recovered archeological data base to be interpreted within the context of the known ethnohistorical record of that time period. Secondly, and most importantly, it allowed the entire Cedar Grove archeological assemblage to be confidently analyzed as a logical, short time span analytical unit. Schambach and Miller were able to partition this 60 year time span of occupation into even smaller temporal units through seriation of grave lots into three groups.

The chronological analysis carried out by Schambach and Miller is in fact at a *fine grain* temporal scale that has rarely if ever been accomplished before in the eastern United States. Although only briefly mentioned in the report (p. 166), their success in identifying variations in Foster Trailed-Incised, Belcher Engraved, and Natchitoches Engraved that reflect small changes " . . . that occurred within years of each other rather than within decades or half centuries." represents a significant methodological accomplishment with implications and applicability far beyond Lester Bend and the Caddoan archeological region. I would hope that this topic could be the subject of a journal article by Schambach and Miller to ensure that their research was widely appreciated.

It is worthwhile emphasizing that the 14 aboriginal burials located at Cedar Grove, which comprised the core of the undisturbed archeological data set and allowed the fine grain ceramic chronological placement of the site, the excellent Caddo IV-V mortuary ceramic assemblage descriptions, and Jerome Rose's exhaustive bioarcheological analysis of the skeletal series, were not an automatic result of the excavation, but rather were in a large part deliberately and methodologically located through extensive and time consuming probing efforts. When Burial 1 was exposed on December 1, 1980, (halfway through the field season) the lack of any indication in the soil of a burial pit outline raised concerns: " . . . as to whether such features could be discerned at all in the sandy subsoil . . . " (p. 66). As a result, systematic probing of the site was carried out over a two week period, identifying an additional 11 aboriginal interments (two below-house floor baby burials were located without probes). The field decision to commit time and energy in systematic probing in search of aboriginal burials was, in hindsight, pivotal in terms of fully realizing the information potential of the site. It is such decisions as this, often passing unnoticed, which distinguish experienced, opportunistic (in the nonpejorative sense of the term) archeologists from the drones, and which make the difference between just another lost opportunity, on the one hand, and the recovery of a valuable archeological data set, on the other.

Another excavation crew, other archeologists, might well have opted for the easy way out, and chosen not to seek out the burials with metal detectors and probes. The result would undoubtedly have been three burials rather than 14 and if the Cedar Grove human skeletal series, and associated grave goods had not been recovered, the site would not have been worth excavating, in my opinion.

The research potential of the Cedar Grove human skeletal remains is convincingly illuminated in the bioarcheology study done by Jerome C. Rose. Following a detailed description of the burials, Rose addresses a number of general research questions, including demography, paleopathology, dietary reconstruction, and genetic analysis. Although the Cedar Grove burial population exhibits an atypical demographic profile (too few children and adult females), it is typical of Caddoan skeletal series in general. In a convincing demonstration that the Cedar Grove burials represent the mortality experience of a single family over a short period of time, Rose presents very similar demographic profiles from a series of six rural Arkansas family cemeteries dating to the late nineteenth and early twentieth centuries.

The high frequency of shared morphological anomalies provides further support for the presence of a family group, with the age and sex distinction of these anomalies (males and young females) suggesting patrilocal residence. Rose determined that the Cedar Grove family suffered "typical" (comparable to other Southeastern prehistoric skeletal series) rates of infectious disease, but leaves the door open to possible interpretations of them having been exposed to European disease (pp. 241, 250). Rose also concludes that the Cedar Grove inhabitants consumed maize at a level intermediate between Fourche Maline and Mississippian populations (pp. 243, 248, 253).

Rose's analysis of the Cedar Grove skeletal series is impressive both in terms of the range of techniques he has brought to bear in order to extract information, and the fact that his research design and problem orientation is structured within a larger temporal and geological framework. In addition to providing a detailed and informative analysis of Cedar Grove, Rose also views the site in a larger context--as a single data point to be integrated into diachronic and regional research questions.

The geographical, temporal, and cultural context provided by Rose for the Cedar Grove skeletal series is matched by the environmental context developed in four chapters (Margaret J. Guccione-Chapter 3, Frances B. King-Chapters 4 and 14, Bonnie W. Styles-Chapter 15). An additional chapter provides a rich cultural-historical background for the Cedar Grove site (Neal Trubowitz-Chapter 5).

Guccione provides an analysis of the intrinsic, periodic (perhaps on a 300 year cycle) channel pattern variations that have occurred along the Arkansas portion of the Red River over the past 150 years. Guccione describes a cyclical pattern of sinuosity changes on both a local and regional scale, with any local stretch of the river expected to experience a century or more of high sinuosity, which then abruptly ends as most meanders are cut off over a 25-30 year period. Relatively low sinuosities then prevail for upwards of a century before sinuosity increases again over a 30-65 year period. This proposed cycle of alternating century long periods of high and low sinuosity, separated by 25 to 50 year long episodes of "rapid" adjustment may perhaps have some implications of the analysis of late prehistoric patterns of settlement within the meander belt of the Red River.

If it was possible to project the schedule of this cyclical alternation between low and high sinuosity for particular segments of the Red River (such as the Big Bend area) back into the prehistoric period, it might be possible to correlate various temporal units (e.g., Caddo V) with a particular phase or phases of river sinuosity (high, low, or transition). If this was in fact feasible it would be interesting to consider the degree to which changing patterns of human subsistence and settlement might reflect adaptive responses to the cycle of channel pattern variation.

In Chapter 4 Frances King provides an excellent (as expected) environmental reconstruction of the presettlement vegetation associations in the Lester Bend area, combined in Chapter 14 with her analysis of the manner in which the Cedar Grove family group utilized the plant resources of the Red River floodplain. Although the assemblage or plant remains recovered from Cedar Grove was not large, a variety of wild and cultivated species were identified, and a number of interesting patterns were observed. Judging from their limited representation in the plant assemblage, nuts were apparently of minor importance at Cedar Grove, and maize does not appear to have been of overwhelming importance, based on its small, fragmentary (if broad) representation across the site. As King notes, these findings are compatible with the bioarcheological interpretations of Rose. The contradictory C12/C13 ratio values (Wolfman-Chapter 17), might, as the author suggests, reflect the processing of maize with lime or in wooden mortars, adding yet another episode to the documented history of difficulties encountered in interpreting C12/C13 ratios in prehistoric eastern North American Indian populations.

I was particularly interested in King's tantalizingly brief discussion of the American lotus (Nelumbo lutea), and its possible importance as a food resource for prehistoric populations in the Southeast. Easily established in still water habitats like oxbow lakes, with edible nuts, shoots, tubers, and root, a dried tuber caloric value comparable to corn, and a root that is similar to potatoes in terms of carbohydrate content) the American lotus would appear to be an interesting subject for further consideration.

The Cedar Grove faunal assemblage, analyzed in detail by Bonnie W. Styles and James R. Purdue, also provided several interesting patterns of resource selection. While the strong representation of white-tailed deer and turkey was not unexpected among terrestrial species, with raccoon, rabbits, squirrels, and opossum filling out a predictable pattern of exploitation, fish and waterfowl along with other aquatic species were present at surprisingly low levels (particularly if the large oxbow lake recorded just to the south of the site in the 1822 General Land Office survey--see Figure 4-1--was in existence in 1700). As other Caddo settlements of a comparable age are located and excavated, it will be interesting to see if they too diverge from what might be expected to have been utilized in terms of the habitat composition of resource catchment areas (Styles 1981).

Rounding out the analysis of various categories of materials recovered from Cedar Grove is the lithics chapter by Marvin Kay. As with many of the other chapters, Kay provides a detailed analysis of Cedar Grove materials which is, at the same time, a methodological contribution to the discipline, with applications far beyond the Big Bend of the Red River. His general subtractive process model represents a clear logical improvement over prior models focused on stone tool production and use (e.g., Collins 1975). The Lester Bend area was resource-poor in terms of lithic raw materials, with the almost entirely local procurement effort focusing on small stream gravel chert cobbles. The small size of the available cobbles both constrained the kind and variety of tools that could be produced, and necessitated initial bi-polar percussion. Kay's replicative bi-polar percussion experiments provided a valuable contextual data (debitage) set for explicating the Cedar Grove lithic assemblage, and contributed to a number of his conclusions in regard to bi-polar flaking. His forthright discussion of the indistinct boundaries between the intuitive typological categories that form the continuum of bi-polar reduction products (bi-polar cores, flakes, pieces esquillees, etc.) was refreshing, as was his identification of pieces esquillees as a natural by-product of the bi-polar process, rather than a finished tool. Interestingly, there was neither evidence, nor discussion of, bone slotting and wedging activities at Cedar Grove.

While the Cedar Grove burials provided important and convincing information concerning the prehistoric occupation of the site, in terms of ceramic chronological placement and bioarcheology, the partially preserved features and blurred internal spatial organization of the Caddo V component represented a difficult interpretive problem--one that was approached through ethnographic analogy. In the report on the test excavations at the Cedar Grove site Frank Schambach's (1982) research design for continued investigations detailed what one might expect to find on a late Caddo farmstead. These predictions were based on two historical documents. The Teran expedition map of the Upper Nasoni village, dating to 1691-1692, provides a detailed glimpse of the typical "village" of dispersed farmstead compounds, each comprised of from one to three houses, one or two storage platforms, and perhaps a ramada or drying rack. A more detailed, if temporally more distant, illustration of the spatial juxtaposition of the various structures comprising a Caddo compound is provided in the Teran-Soule model of the composition and spatial organization of late Caddo farmsteads and "villages."

Within the context of this model, Neal L. Trubowitz's interpretation of the Cedar Grove compound as having consisted of a linear arrangement of at least three circular habitation structures, each with an associated ramada structure located to the east, is both impressive and convincing.

The southern most of the three houses (Structure 1-Feature 3) was the best preserved, with enough postmolds and features still present for Trubowitz to characterize it as a 9.6 m diameter round walled (cane latticework and pressed clay) house with a thatched roof, a baking pit, bell shaped storage pit, and several subfloor subadult burials (a nine month old infant and a six year old child). The cluster of postmolds (Cluster 2) located to the east of this house, which contained a partial rectangular pattern, could well represent a ramada structure. Given the clear co-occurrence in Structure 1 of a high concentration of daub, subfloor child burials, and a ramada to the east, Trubowitz's proposed Structure 2 (Feature 24) to the north is reasonable enough--with an infant burial, a ramada postmold cluster (Cluster 3) to the east, and a high frequency of daub. The existence of a third Caddo house just to the north of Structure 2, which seemed rather tenuously based on a few postmolds and a high daub frequency, was considerably strengthened with the discovery of a child burial (Burial 16) in that area after excavation of the prehistoric component of the site had been completed. I am quite interested in hearing if the ceramic assemblage recovered at the same time as Burial 16 contains any temporal clues, since it would be nice if Structure 3 could be found to date toward the end of the 60 year span of late Caddo IV-Caddo V occupation at Cedar Grove. On the basis of their fine-grain ceramic chronological analysis, Schambach and Miller place the southern most house (Structure 1) in a 1670-1700 time frame, while Structure 2, just to the north, is slightly later.

If Structure 3 could in turn be demonstrated to postdate Structure 2, Cedar Grove would contain a nice south to north linear/temporal sequence of three to four house-ramada pairs which could well represent the periodic structural abandonment and rebuilding process of a family unit over a period of six decades.

Although I think that it is fairly probable that this line of three to four Caddo IV-V structure-ramada pairs, situated along the crest of a point bar ridge on the convex bank of Lester Bend, does in fact represent rebuilding episodes (each structure lasting 15 to 20 years?), it may not be a perfect south to north temporal sequence, since two of the early (Ceramic Group 1) burials, along with several Group 2 burials are from the area north of Structure 3.

The 50 m gap in the house line at Cedar Grove between Structures 1 and 2, caused by road construction, may have contained a fourth structure-ramada pair, in addition to the Structure 2 associated burial cluster that Schambach and Miller locate there. (Editor's note: Smith's comments on the possible temporal sequence of occupation at Cedar Grove were made in reference to the draft

version of this report. See Trubowitz Chapter 18 for an expanded discussion of this topic.)

A final and fascinating contextual analysis of the Cedar Grove site, carried out by Neal Trubowitz, involved determining the nature and intensity of contact between the Cedar Grove inhabitants and Europeans.

Starting at the regional level and then focusing in on the Lester Bend area, Trubowitz first outlines the European presence in the area, and discusses the archeological indicators of European contact that might be expected to occur at Cedar Grove. For a number of reasons Trubowitz concludes that evidence of European contact at Cedar Grove might be minimal, at best. There is " . . . no known European description of an encounter with the Caddo in the Spirit Lake or Boyd Hill archeological localities until after the Cedar Grove site had been abandoned." (p. 35). Although Europeans were certainly present in the Caddo area during the 1670-1730 span of occupation at Cedar Grove: "the Kadonadacho living on Great Bend in Arkansas were the <u>last</u> to experience regular face-to-face contact with Europeans within the area where they resided" (p. 35). European goods, mostly of a perishable nature, would have occurred, when preserved, in high status, elite goods situations. It is as a result, appropriate that the only potential evidence of European contact found at the site is in the form of two small bone discs which may or may not represent the assimilation of the European concept of a button. These two "buttons," when viewed in the context of Trubowitz's ethnohistorical analysis, provide an eloquent indication of Cedar Grove's twilight position between two cultures.

PEER REVIEW: Cedar Grove: An Interdisciplinary Investigation of a Late Caddo Farmstead in the Red River Valley

Dee Ann Story

Last spring when I first reviewed the Cedar Grove report it was a draft version which consisted of two volumes written at different stages in the analysis. While even in this form the study was impressive, it was marred by poor integration and sequencing of chapters and minor, but distracting, errors. The final version is changed significantly and I welcome the opportunity to revise also my comments as many of them concerned problems that have been resolved.

In its present form, the report is one of the best, truly interdisciplinary studies of the Caddoan site. It reflects a thoughtful, problem-oriented research design, careful recovery of field data, and well-integrated analyses by skilled specialists. The report also illustrates nicely that much can be learned from a severely disturbed site and by a project constrained in the areas it could investigate. The project archeologist, Neal Trubowitz, the contributing researchers, and the contract program of the Arkansas Archeological Survey are to be complimented for providing us with a study that surely will join the ranks of such Caddoan classics as Alex D. Krieger's contribution to the Davis site report (Newell and Krieger 1949) and Clarence H. Webb's Belcher site monograph (Webb 1959).

Although Cedar Grove is multicomponent, and the report includes brief analyses of material from the nearby Sentell site, it is the late Caddoan occupation at Cedar Grove that was the primary target of research. Given the constraints on the excavations at Cedar Grove and the limited nature of the work at Sentell, the biased emphasis of the study is justified.

Largely on the basis of the ceramic analysis by Frank Schambach and John Miller (Chapter 11), the late Caddoan component at Cedar Grove is identified with the Belcher phase and the recently defined Chakanina phase. It is dated from late Caddo IV times into the middle Caddo V period; or, translated into the Christian calendar, it is estimated to have been continuously occupied by a Kadohadacho group from A.D. 1670 to 1730, perhaps even A.D. 1650 to 1750. Appropriate to the late dates assigned, the relationships of the site to a document-derived settlement pattern model (called the Teran-Soule model) and a diachronic model of Aboriginal/European contact (called the Great Bend Contact Era model) emerge as the most uniting research questions (Chapter 2). A number of other important issues, however, are addressed, and a major strength of the study is its comprehensiveness.

Since I found the 18 chapters comprising the report generally to be of high caliber, I will not comment on all of the individual studies. Rather, I will review only those that are of particular interest to me or that constitute what I see as major elements of the research. These remarks are followed by a few general observations on Caddoan archeology stimulated by the Cedar Grove study.

The physical setting of the site is ably discussed in Margaret Guccione's tightly written analysis (Chapter 3) of historically recorded changes in the Red River. It makes clear to the nonspecialist the processes which variously bury and erode sites in the active floodplain of the river, as well as provides a basis for predicting settlement patterns, especially the locations where sites are likely to have survived recent meanderings of the Red. Although not explored by Guccione, the geomorphologist's ability to sequence certain landforms in the floodplain also can be of considerable predictive value to chronology building research. Equally as important, discrete assemblages of temporally less diagnostic specimens, such as faunal remains and lithic debitage, can be isolated and studied without the all-too-common problem of component mixing. Thus, for example, the relative youthfulness of the ridge and swale topography on which Cedar Grove is situated explains the tightness of the ceramics from the site (Schambach and Miller, p. 168), as well as has provided us with one of the few (to my knowledge) unmixed collections of late Caddoan lithic debitage. Guccione's conclusion that variations in the Red River channel within the study area since 1827 have been caused by intrinsic factors rather than external ones, makes one usefully cautious in evaluating riverine changes as evidence for climatic change.

Much of the perceived significance of the Cedar Grove site derives from its late chronologic placement and, hence, potential for: (1) testing Schambach's (1982) Teran-Soule model, and (2) studying the impacts of Europeans on Caddoan (Kadohadacho) groups living in the lower portion of the Great Bend region. Neal Trubowitz elaborates on this potential in Chapters 5 and 12. The main objective of Chapter 5 is to explore the implications of little or no evidence of European contact at sites dating well into the contact era. To that end, a diachronic model is constructed from secondary sources pertaining to European expeditions and settlements between A.D. 1500 and 1750. This model postulates that few or no trade goods will be found at Kadohadacho sites dating prior to A.D. 1730 because: (1) they were the last of the Caddoan groups to have direct contact with Europeans; (2) until 1719, when La Harpe established a post on the Red River, other native groups filtered the flow of European goods to the Kadohadacho; (3) the redistribution system among the Kadohadacho survived late and limited the accessibility of European items to farmsteads such as Cedar Grove; and (4) many of the early European trade items were of perishable nature and are not expected to survive archeologically.

This model has appeal, primarily because it articulates a number of different processual aspects of European contact with Caddoan groups. Nonetheless, I have questions about certain aspects of the model as well as doubts about how convincingly it explains the absence of unequivocal evidence of European contact at Cedar Grove. If, as detailed on pages 33-39, European travelers observed a number of European goods along the routes they actually traveled, then is it not probable that they would have found the same in areas they happened not to traverse? What was the impact of the early French traders? Because most of these traders probably were illiterate, their activities probably have been much underrated. Admittedly it will be

difficult to ferret out the needed information, but, as Mildred Wedel (1981) points out in her excellent ethnohistoric study of the Deer Creek site in Oklahoma, the pertinent records have yet to be systematically combed. Could one not argue on both archeological and ethnohistoric grounds that the Kadohadacho groups enjoyed high status among other Caddoan and nonCaddoan groups and that this position would favorably affect their access to European goods? Potential differences in social accessibility of goods is recognized in the model but only as a variable within Kadohadacho society. Lastly, are we dealing with diachronic processes which occurred over such brief period of times that archeologically we are forced to see them as being synchronic?

Regardless of the viability of my questions regarding the Great Bend Contact Era model, I believe that the paucity, perhaps absence, of European items or any other indication of European contact (despite very diligent search), is a significant line of evidence suggesting that the site was abandoned before A.D. 1730. Moreover, the evidence to the contrary (see especially Chapters 11 and 17) is not so strong as to establish conclusively the terminal date as being as late as A.D. 1730. It seems to me best to leave the matter open to question; in other words, as an issue to be resolved by future research.

Chapter 7, by Neal Trubowitz, presents a thorough account of the field organization, sampling methods, and laboratory procedures. Many matters not often touched upon in a report, yet useful to evaluating a data recovery program, are discussed. A good example of the attentiveness to detail is provided by Table 7-3 which quantifies the volume of dirt water separated or passed through screens of varying mesh sizes. The only question I have concerns the implications of the stratigraphic relationship between the adult burials and the midden. On page 67 it is stated that these interments had been made before the extension of the general midden over them. Subsequently, in Chapter 10, on pages 97 and 108, and in Chapter 17, on page 257, it again is noted that the midden, which presumably was undisturbed, overlies the adult burials. Since these include the burials (Group C) assigned to the latest phase (Chakanina) of the Caddoan occupation, I cannot help but wonder where is the midden refuse to be linked to these burials and, conversely, where are the burials that might be associated with the midden? In other words, this stratigraphic sequence implies a complexity in the occupation of the site that, it seems to me, has not been addressed adequately.

The study of native-made ceramics (Chapter 11) by Frank Schambach and John Miller is a pivotal section of the report. It provides much of the basis for the cultural and temporal placement of the late Caddoan occupation and for unraveling the internal structure of this component. It also is notable for its discussion of the evidence pertaining to the use and recycling of vessels, the definition of one new type and 30 new varieties, and the application of a hierarchical descriptive system to classify decorations on rim and body ceramics.

Few analyses of Caddoan pottery have been as thorough or as provocative. While I am not as confident as Schambach and Miller in the absolute ages assigned, they have marshaled an impressive case for a finely-tuned ceramic chronology which surely dates quite late in the Great Bend sequence. Indeed, with this study as a model, the application of Philip Phillips' (1970) variety concept seems certain to become increasingly popular in Caddoan research. Justifiably so. It is a practical and useful classification system when the varieties are defined on the basis of good contextual data and extensive comparative material. For replicability, it is critical that any new variety be well described and well illustrated. Again, this chapter provides an excellent model.

My reaction to the descriptive system is less enthusiastic, but perhaps I am just being a fuddy-duddy. Certainly there are serious problems in apply the "Krieger-Webb" typology to sherds, but just how effectively this descriptive system resolves these problems remains to be seen. I found it cumbersome to use and, in the end, did not feel that it contributed that much to the analysis of the sherds from Cedar Grove. Hopefully, we can come up with a more parsimonious solution, or at least a solution that is more straightforward.

Marvin Kay's analysis of the subtractive technology (Chapter 13) is of general interest for its useful refinement of Michael Collins' (1975:Figure 1) often-cited lithic reduction model. Subtractive technologies are niceties in the archeological record because of the waste byproducts and manufacture failures usually associated with them. This, of course, has been long recognized and has been systematically dealt within the study of lithics. For other raw materials, such as bone and shell, this has not been the case. Technological debris to be linked with nonlithic artifacts probably is to be found mostly in the specimens submitted to the faunal specialist, or, worse yet, in piles of residue deemed to be of no research value. Kay's model draws attention to these, and other, implications of subtractive technologies, although he is not able to follow through in the actual analysis of specimens. The chapter, nevertheless, is a solid study of the stone, bone, and shell artifacts recovered from Cedar Grove. The only aspect that causes me to raise my eyebrow a bit is the very high incidence of bipolar flaking debris, probably because I have so much difficulty recognizing the residue from this technique.

Chapter 14, Frances King's study of the macroplant residue, and Chapter 15, Bonnie Styles and James Purdue's analysis of the faunal remains, are welcomed additions to the still meager literature on Caddoan subsistence practices. The data are well presented and the inferred economic activities are well supported. Very noteworthy aspects of the Cedar Grove study are the complementary lines of evidence pertaining to diet, especially the utilization of maize. Small bits of charred corn were widely distributed at the site (Table 14-1), but corn was not truly abundant as it totaled a mere 7.1 grams (Table 14-2). As King points out on page 209, this distribution . . . "indicates a low level of usage or processing methods which were not conducive to carbonization and preservation." Jerome Rose's excellent study of the skeletal remains from the site (Chapter 16) and the high stable carbon isotope ratios obtained from 7 samples of human bone (Chapter 17:Table 17-1) offer significant refinements to King's conclusions. Namely, they indicate that the consumption of maize was greater than can be inferred from the plant remains alone. In addition to the importance of this conclusion, the Cedar Grove study illustrates well the general need for considerable care in assessing the importance of plants to the diet on the basis of charred remains alone. It also provides an outstanding example of the value of interdisciplinary research.

Rose's chapter on the bioarcheology is an especially impressive component of the interdisciplinary research effort at Cedar Grove. The strengths of the study are many and include the significance and variety of the questions addressed, the comparative nature of the analysis, and, as best I can judge, the soundness of the conclusions reached. One only can look forward to the day when more such studies have been completed and there can be more extensive comparisons within and beyond the Caddoan area. In this regard, then, Rose's chapter illustrates well what can be gained from the analysis of curated skeletal remains. Since it also makes clear that much is yet to be learned in bioarcheology, the study also highlights the importance of the position taken, for example, by Jane Buikstra (1981) on the reburial issue.

The final chapter by Neal Trubowitz summaries the Cedar Grove findings and compares them against a series of predictions derived from ethnohistoric data synthesized into the Contact Era model and the Teran-Soule model. Brief comparisons also are made with Don Wyckoff and Timothy Baugh's (1980) study which outlines a number of archeological correlates for Hasinai political and religious

elites. Several refinements to the Teran-Soule model are offered, but, in general, it is concluded that the archeological remains attributed to the Belcher phase and Chakanina phase occupation at Cedar Grove match well with the written records.

Thus, in addition to being notable for its interdisciplinary research, the Cedar Grove project stands out as one of the few in Caddoan archeology to make extensive use of the direct historical approach. Since the benefits to be realized from this approach are quite evident in the Cedar Grove study, it hopefully will stimulate more ethnohistoric analysis of written records pertinent to the Caddoan area. Without meaning to detract from their considerable contribution, I suspect that Swanton (1942) and Griffith (1954) have lulled too many of us into believing that little new is to be gained from restudy of the primary accounts and that our research dollars are better spent on other types of special analysis. However, it is clear when one reviews the work being done by Mildred Wedel (e.g., 1978; 1981) and T. N. Campbell (e.g., 1979; 1983; Campbell and Campbell 1981) that much of value can be gleaned from reassessing known records and seeking out new ones. Perhaps archeologists can significantly further these research efforts by more often including an ethnohistorian, as defined by Wedel (1976:3-5), as a member of their interdisciplinary team.

Because there is a great deal in the Cedar Grove study that researchers will want to emulate, I believe that it is important to be mindful of the diversity within what we identify as Caddoan archeology. Significant differences appear early and are most obvious when sites in the Arkansas Valley are compared with those on Red River and farther south. By late prehistoric and historic times, there is even more regional differentiation and a number of contrasts can be drawn, for example, between Caddoan remains in the Great Bend region and those in the upper Neches-Angelina drainage. Consequently, we need to develop more regionally specific models as well as be guarded in the use of any panCaddoan framework such as a Caddo I-V. What works well in the Great Bend region may not be appropriate to another region.

Certainly, with the Cedar Grove study much of the significance and uniqueness of late Caddoan developments in the Great Bend region is brought into sharp focus for the first time.

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